

## **CEERI CENTRE, CHENNAI**

**Technology Transfer Function held on 9<sup>th</sup> December 2009 at Conference Hall, CSIR Madras Complex, Chennai**

**CEERI Centre, Chennai**

has entered into agreement for the technology transfer of

**X-ray Imaging based Mango Sorting System**

with

***M/s. Proteck Circuits & Systems Pvt. Ltd., Chennai***

and

**Plastic Waste Sorting System for Recycling of PET Materials**

with

***M/s. Dintis Technologies Pvt. Ltd., Bangalore***

for commercialization during the Technology Transfer function held on 9<sup>th</sup> December 2009 at the Conference Hall, CSIR Madras Complex, Chennai

### **About the Technologies:**

#### **X-ray Imaging based Mango Sorting System**

Mango is one of the most important fruits in India. The internal quality of mango is a concern for consumers and export traders. The Indian mango variety viz. alphonso is the most important fruit for export. This variety, however suffers from physiological disorder of spongy tissue growing in the pulp portion of the mango because of which, its export value and consumer satisfaction is affected. So far the causative factor has not been identified and there is no proven technology for its control as on today. Also certain varieties of mango viz., neelam and totapuri have seed weevil or stone-weevil infestation, which can affect the processed pulp. Due to this, the exporters and processors are unable to provide quality mangoes and pulp free from the internal disorders. The internal disorders are not visible to human eye and manually not possible to detect the defect-infected mangoes. Till now, certain countries had banned Indian mangoes because of this. In such scenario, the immediate priority is to detect spongy tissue and seed weevil infected mangoes by instrumental means and grading good quality mangoes for consumption and export.

With this in view, Central Electronics Engineering Research Institute, Chennai Centre, CSIR Madras Complex has taken up a project with funding support from Department of Science and Technology (DST), New Delhi. Under this programme, a totally non-destructive indigenous technology was developed by employing X-ray imaging technique to sort the mangoes based on internal disorders in real time. This system will be a boon to mango growers, exporters, traders and processing industries. The X-ray scanned mangoes are safe for consumption and there is no health hazard. The developed system was also demonstrated to various user agencies, equipment manufacturers and potential entrepreneurs during a technology awareness workshop held on 4<sup>th</sup>-5<sup>th</sup> June 2009 at Chennai.

This technology is now transferred to M/s Proteck Circuits and Systems Pvt. Ltd., Chennai for commercialization.

## Plastic Waste Sorting System for Recycling of PET Materials

Plastics are ubiquitous and contaminating the environment. Disposal of plastics has become a technological and social subject that has created and attracted a lot of attention from researchers, business people, politicians, environmental activists and general public. One way, to reduce the environmental pollution due to plastic waste of both disposables and durables, is to recycle them, i.e., to recover used plastics from municipal or industrial waste streams and convert them into new useful objects.

Recycling of plastics waste is steadily gaining importance because of the efforts on conservation of oil resources and the shortage of disposal sites. The plastic waste is separated into different material types by manual sorting, to obtain recyclable materials of high value. The purity of sorting fractions obtained in this way is not sufficient for direct recycling of pure polymers. Moreover, it is uneconomical and the working conditions are not only unpleasant but even hazardous to health. Considering the above difficulties, an automatic plastic sorting approach, involving automatic materials identification followed by a mechanical sorting, appears as an attractive alternative to manual sorting.

NIR Spectroscopy helps in identification of individual plastic types and offers a promising approach to waste sorting. Online inspection technology preferably makes use of NIR spectrometry, which is capable of operating rapidly. Spectroscopic methods are non-invasive and non-destructive measuring systems. These methods provide spectra, i.e. large set of data, from which meaningful information can be rapidly extracted for analysis. The detection speed should match the specific situation created by type and size of arriving parts. The identification should be very accurate in terms of its ability to distinguish different plastics, and reasonably precise.

On realizing the importance of the need, CEERI Centre, Chennai has developed an NIR spectroscopy based plastic waste sorting system with funding from the Ministry of Environment and Forests. The system, consisting of a high-throughput NIR spectrograph and specially designed collection optics, is used to record the Near Infra Red spectra from disposed consumer plastic packaging wastes conveyed on an industrial conveyer belt. Spectra of different plastics are recorded between selective narrow ranges of the NIR Spectrum.

The plastic waste typically includes six types of materials namely poly-ethylene (PE), poly-ethylene-teraphthalate (PET), poly-propylene (PP), poly-vinyl-chloride (PVC), high density polyethylene (HDPE) and poly-styrene (PS). The experimental lab model classifies them and sorts PET alone. Through the existing setup, PET materials can be sorted close to hundred percent with up to 200 kg per hour throughput. The maximum throughput is limited by speed of the spectrograph used in the system. Higher throughputs up to 1 ton per hour can be achieved by using high-speed spectrograph and faster sorting routine.

This technology is now transferred to M/s. Dintis Technologies Pvt. Ltd., Bangalore for commercialization.

### Proceedings of the technology transfer function:

During the technology transfer function, **Dr.A.S.V. Sarma, Scientist-F & Scientist-in-charge, CEERI Centre, Chennai delivered the welcome address.** He mentioned that as an R & D laboratory, there could be nothing more pleasant than the event wherein the technologies are being transferred to the entrepreneurs for commercialization, since it's a researchers' dream that the developed technologies should reach the market. He also thanked both the entrepreneurs for their trust in CEERI that they came forward to take the technologies for

commercialization and he assured that CEERI would provide all the support in commercializing the technology.

**Dr. R. Govindaraj, Scientist-EII, CEERI Centre, Chennai briefed about the x-ray imaging based mango sorting system.** He said that during the technology awareness workshop held in June 2009 at Chennai, it was suggested that CEERI, Chennai should find a suitable industry partner for making a commercially viable prototype model of the system. In this regard, CEERI had taken all efforts in finding a suitable industry partner and interacted with few companies including Ms/. Proteck Circuits & Systems Pvt. Ltd., Chennai and demonstrated the system to them. As a result, the company came forward in taking the technology for commercialization.

He has also briefed about M/s. Proteck Circuits & Systems Pvt. Ltd., which is a multi-product engineering group that manufactures, distributes and supports machinery & software for industrial applications. He said that as a technology driven group, they are on the trajectory of high growth, leveraging the economic growth in India and elsewhere with engineering skills and managerial competence.

**Shri V.Venkataraman, Scientist-F, CEERI Centre, Chennai briefed about the plastic waste sorting system for recycling of PET materials.** He said that the first lab-model was demonstrated to then Director of HSM Division of MoEF, Dr. Indrani Chandrasekhar, Shri Panneerselvam, Senior Vice President of M/s. Futura Polyesters, Chennai, DG of CIPET, one of the project review committee members and Secretary of Tamil Nadu Plastic Manufacturers' Association. He also mentioned that the developed technology employs state-of-art techniques like, NIR spectroscopy, on-line signal capture and signal analysis using chemometrics, thus making it comparable to the internationally available systems. He said that CEERI decided to transfer the technology in it's present state and then provide necessary support to the entrepreneur, who comes forward to take up the technology.

He also briefed about M/s. Dintis Technologies Pvt. Ltd., Bangalore, He said that the MD of the company was impressed by the plastic sorter and decided to take up the technology with the confidence to nurture the technology and commercialize it successfully.

**Er. R.K. Gupta, Scientist-G & Head - Technology Networking and Business Development Cell of CEERI, Pilani addressed the gathering.** He said that he was feeling himself proud to be a member of CSIR family, when he was signing the agreements with M/s. Proteck Circuits & Systems Pvt. Ltd., and M/s. Dintis Technologies Pvt. Ltd., from CEERI side, about an hour back on that day. He also mentioned that he was impressed to see the activities at CEERI Centre, Chennai and expressed his hope to get much more technologies for commercialization in the near future. He assured the entrepreneurs that CEERI Chennai Centre would provide all the necessary support required by them for commercialization of these technologies successfully.

**Shri Chander Parkash, Scientist-F & Director, DST, New Delhi delivered a Special Address.** He said that it was a matter of great pride that the two of the technologies developed by CEERI Centre, one supported by Ministry of Environment and Forests and the other supported by Department of Science and Technology, were being transferred to the industry for commercial exploitation.

He said that when he first took over the activity of industrial instrumentation area at DST in 2007, he requested the DST and the committee members of the project on x-ray imaging based mango sorting system, to conduct an onsite review of the project. He mentioned that he brought the committee members for onsite review of the project and they were very happy to see the developments at that time. The committee appreciated the efforts made by CEERI Chennai in doing more than what was projected in the project proposal. The development of conveyor for transporting the mangoes, which was not a part of the project, was also completed by CEERI utilizing their own workshop and mechanical engineering facilities. From that day onwards, he

said that DST had started pro-actively interacting with CEERI to see that this technology gets transferred to the industry. He mentioned that in June, 2009, a Technology Awareness Workshop was organized and industries as well as horticulturists & agriculturists attended the workshop and that event was a very big success. He expressed his happiness that M/s. Proteck Circuits and Systems Pvt. Ltd., had imposed their trust in the technology developed at CEERI Chennai and hoped that the technology will flourish and many new products will come out in the near future from CEERI Centre.

He congratulated CEERI and expressed his thanks to Department of Science and Technology and to the Project Advisory Committee, Dr.Sankaran and Dr.Chandra Shekhar, two of the esteemed members, for guiding DST in their endeavor, to select this project, which is coming to a very fruitful completion.

**Dr. Nagesh R. Iyer, Director, SERC & Coordinating Director, CSIR Madras Complex, Chennai delivered the Felicitation Address on the occasion.** He wondered that within a short span of time, after organizing the technology awareness workshop during June 2009, the technology is being transferred. He said that scientists do a lot of innovative research at the laboratory but it is important to pursue that and to see in a very broad way how it could be delivered to the industry. He prayed to have more such functions at CSIR Madras Complex, because DG, CSIR calls this as not CSIR Madras Complex but as CSIR Innovation Complex. He said that he was sure this complex would live up to the real meaning of that.

He said that we are looking at two sorting systems and one is related to fruit that is going to be useful for the mankind & commerce of the country and the other in which the focus is on waste to wealth where we are trying to launch major initiatives at the CSIR level. He complimented all the scientists involved and also thanked Department of Science and Technology, Ministry of Environment and Forests, the officials and all those connected with it and all those review committee members, particularly who must have given a lot of inputs. He said that he felt it as a very proud moment for this campus and said that we should move forward in this direction.

**Dr. Chandra Shekhar, Director, CEERI, Pilani presided over the function and delivered the Presidential Address.** He mentioned that it is indeed a very pleasant moment and a moment of fusion of effort of R & D teams over a long period of time, so they really are presently seeing some fruit at the end of the entire set of efforts. He said that it is indeed very heartening to see that many technological activities, start from hope, some start on a kind of imagination, some start from suggestions from various colleagues, industry, government funding agencies like, DST, Ministry of Environment and Forests and also sometimes certain things start from the initiatives of the individual scientist. It's always a very pleasant ending, when we find that not only good science has been done but technology development, geared towards solving a specific problem that can add value to our society, has also been achieved. He mentioned that he was very happy to say that both these projects eminently qualified and had steered the course in that particular direction.

He praised the role of sponsoring agencies, in providing resources, monitoring guidance, industrial interactions and encouragement, since what scientists need most more than anything else is an encouragement that they are doing something good and that boosts their confidence.

He also said that this kind of technology transfer is now in a different paradigm because long back we used to have closed economy, and indigenous technology was whatever could be developed in the country. He wondered where we stand among the big giants in developing the technology, when we compete against everybody else globally, what we will do with these indigenously developed systems and answered that we all know that there are small, medium enterprises, which are really the backbone of national economy. In fact, what is true for the US economy is certainly true for the Indian economy also and lots of enabling role in terms of technology development, demonstration, and dissemination adding value to the society could

be achieved, by co-working between the research laboratories, the entrepreneurs and funding and supporting agencies that support and provide resources for research. So, he said that it is one such happy culmination that we are seeing and hoped to see more and more of the same. He opined that the frequent interactions by way of technology demonstrations & seminars, by way of sending out leaflets and posting developments on websites would make it more feasible for more projects to go in that particular direction.

He congratulated both the project leaders and the teams and the present and past two scientist in-charges, who have supported the activities, in their tenures. Dr.Chandra Shekhar thanked Dr.Nagesh Iyer, for the great atmosphere that he provides in the campus for the individuals to work and thanked DST and MoEF for their sustained support.

He also thanked both the technology partners, M/s. Proteck Circuits and Systems Pvt. Ltd., and M/s. Dintis Technologies Pvt. Ltd. He hoped that these would be viewed as serving examples for reinforcing our own faith as a society in trying to identify Indian needs and trying to develop Indian technology by Indians to be manufactured by Indians. He said that we are open to knowledge from the world, of course, we receive knowledge and inputs from everywhere or across the world, and we also contribute to it and hope to contribute even more. He said that we should create more and more of these virtual cycles, where we try to solve our own problems through our own technologies utilizing the global knowledge, even as we contribute to the global knowledge itself. So, he said that he was very, very pleased and offered his best wishes to all concerned.

**After delivering the presidential address, Dr.Chandra Shekhar exchanged the technology transfer agreements (signed earlier on the day) with Shri K. Balasubramanian, Managing Director of M/s.Proteck Circuits & Systems Pvt. Ltd., Chennai and Shri Dintis Thomas, Managing Director of M/s.Dintis Technologies Pvt. Ltd., Bangalore.**

**Shri K.Balasubramanian, Managing Director, M/s. Proteck Circuits & Systems Pvt. Ltd., Chennai addressed the gathering.** He said that it was his pleasure to be present at the function. For him and for their company, it was a novel experience, since until now, they never had any interaction with the national entities in the areas of technology. He said that their company always developed its technology in-house or had bought technologies from overseas and when this idea was proposed to him by his colleague, Mr.Harinathan, his instinctive reaction was to say why not. He said that they had no previous experience of working on fruit sorting and the whole idea of mango sorting and extending it to other fruits and perhaps to other applications is an altogether new area of business for them. He said that, as on date, most of their business, in terms of providing products and services to the manufacturing and printing industries, to certain extent, has something common with CEERI. They also work on certain strategic areas for defense establishments. So he said that it was a logical extension that they should co-operate and see where they could take technology that are developed within and convert into a product. But the convergence of interest lies in the novelty of development. He said that one of the mission statements of their company is to delight their customers with products, technologies and ideas and exceed their expectation and this being a fundamental motto of all the products and services that they deliver to the customers. So, he said that they see potential in the mango sorting system, and they would apply their energy in building the product, engineering it for industrial use and making it a deliverable that can work on the wealth of mango sorting. He said that he and his colleagues look forward to it with great enthusiasm.

**Then, Mr.Dintis Thomas, Managing Director, M/s. Dintis Technologies Pvt. Ltd., Bangalore addressed the gathering.**

He said that they are actually into the business of non-contact measurement, control and sorting applications and they carry out any kind of non-contact, non-destructive dimension

measurement, whether it is length, speed, thickness, diameter, width, etc. The lowest size product they measure is an optical fibre of about 120 micron thickness. All optical fibre manufacturers in India are using their equipment to produce and control optical fibres to an accuracy level of 0.01 micron. Apart from measuring, they also control the process to a high precision level. They are also into very high-end applications like Nuclear Fuel Complex (NFC), Hyderabad, where each and every nuclear pellet manufactured is measured with their equipment, without touching the product. The high-end or the bigger size product they measure today, is the sewage lines in China that are getting constructed on the roads. In India, the lines are constructed using concrete, fragments and other things. In China, actually these are getting replaced with high density polythene pipes, having diameter of more than 3 or 4 meters. They measure the diameter as well as the wall thickness of the pipes in real-time.

He explained in detail how his association with CEERI or CSIR, culminated in this technology transfer and told that there are people in the industry who are looking for affordable technologies, which could be utilized for the masses in India. He assured that this technology is now their responsibility and it is their duty to develop it further and bring back to CEERI to show their expertise. He hoped to have many more technologies from CEERI.

Finally, **Shri R.Sridhar, Scientist-F, CEERI Centre, Chennai, proposed a Vote of Thanks.** Apart from thanking DST, he thanked the Ministry of Environment and Forests, who have funded the project on “Plastic Waste Sorting for Recycling”, which has culminated in the technical know-how. He said that although the latter could not have their representation here, they have to be thanked for their financial and moral support towards development of an important technology for solid waste management, which is a need of the hour.

Shri Sridhar also thanked the two entrepreneurs, without whom, this function would not have materialized and said that whatever efforts put-in would end up in drain, without such entrepreneurs coming forward to take up the developed technologies & commercialize them so that the end users and society get benefited. He sincerely wished both of them success in their current and future endeavors.

The programme came to an end with the recitation of the National Anthem.

**[Dr. ASV Sarma]  
Scientist-In-Charge**