# Technology Details

Name of the Lab: CSIR-CEERI, Pilani

**Date: 13-05-2019**

| 1	Title of Technology (Product/Process/Design/Equipment)	**MEMS-based Accelerometer**
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	The process/technology know-how document is with (for validation): **Semi-Conductor Laboratory-Mohali (SCL-Mohali)**
3	Application/Uses/Problem being addressed	**Strategic Sector**
4	Salient Technical Features including Competing Features	**See Specifications: Annexure-I**
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	**TRL-5**
6	Environmental Considerations, if any	**See Specifications**
7	Status of Commercialization	**It is being planned with SCL**
8	Major Raw Materials to be Utilized	**Silicon MEMS technology**
9	Major Plant Equipment and Machinery Required	**Common semiconductor clean room equipment with DRIE (Deep Reactive Ion Etching) system**
10	Techno-Economics	**Have potential for import substitution**
11	Technology Package	**Process/technology know-how development and documentation**
12	Contact Details	**Director, CSIR-CEERI, Pilani**
13	Photographs (please provide high quality photographs of proof of concept & validation)	**Please see below:**

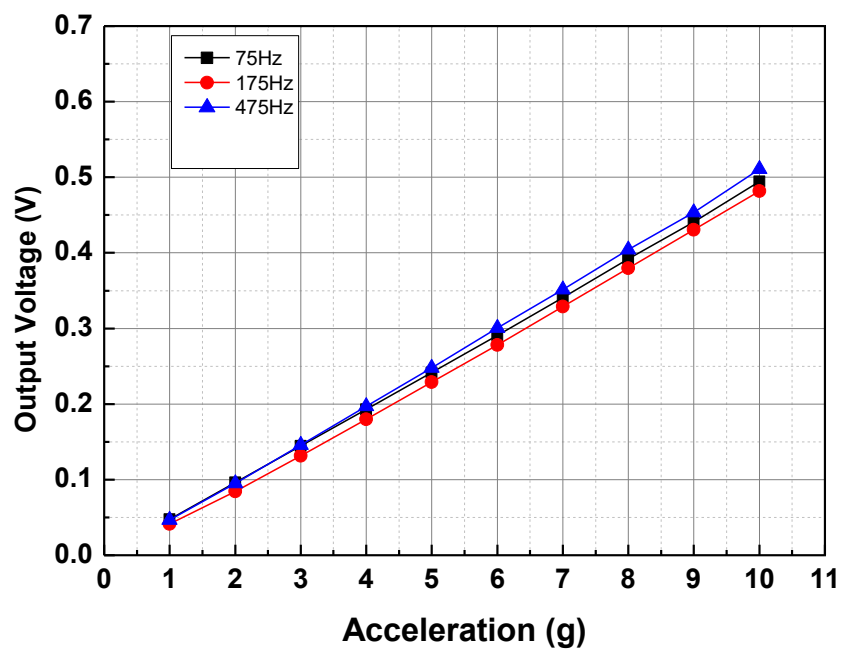# Development of MEMS-based Accelerometer
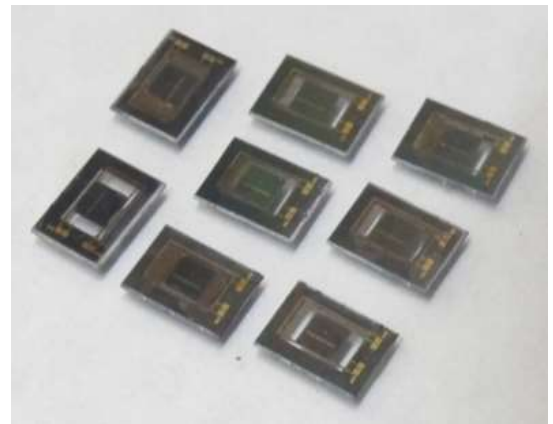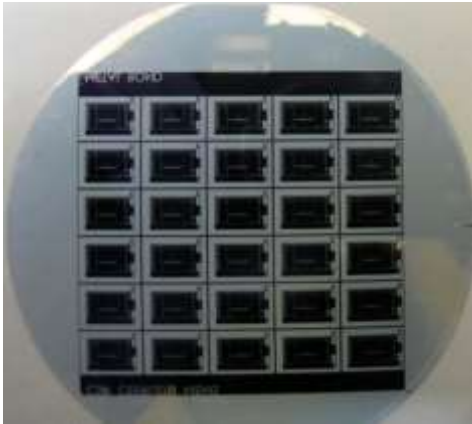
Fabricated Accelerometer Sensors (3" wafer & diced chips)
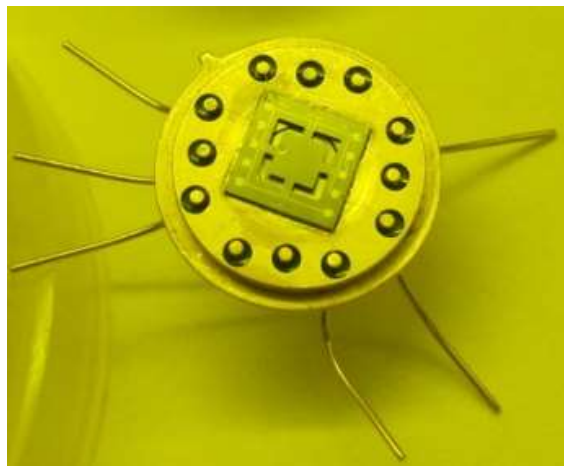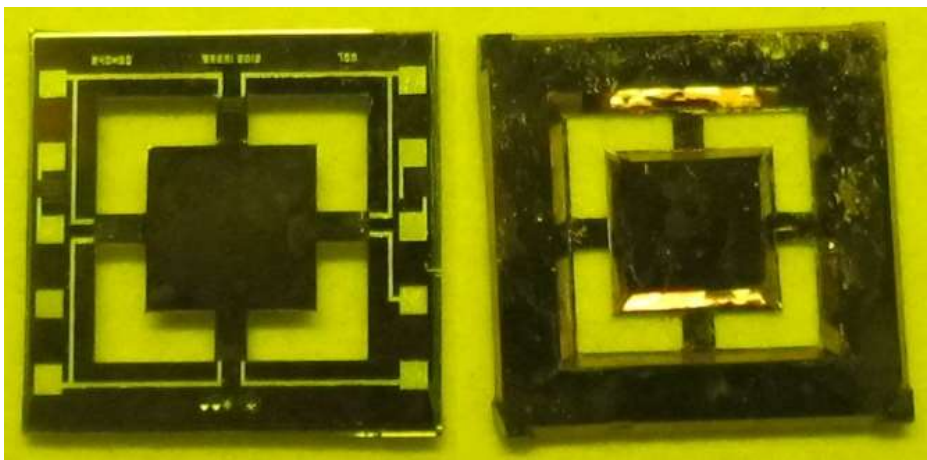
Fabricated accelerometer sensor
(Top & Bottom view; TO header package)
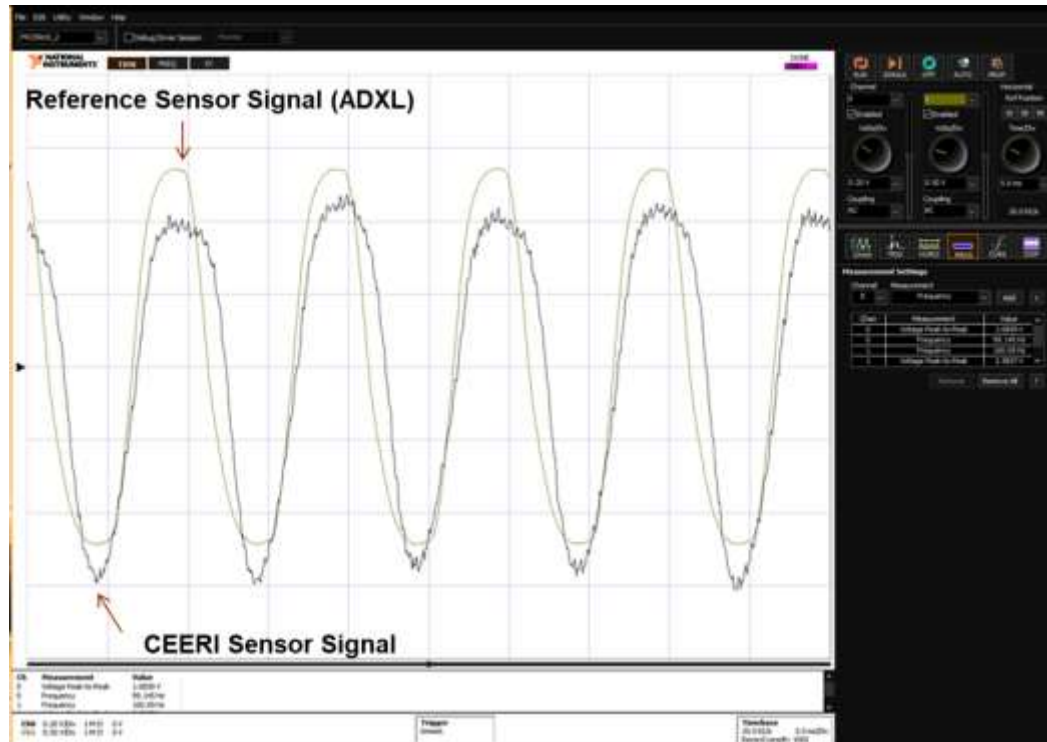
Low-g (± 4g) sensitivity ~ 75 mV/V/g with amplification @ 100 Hz

Acceleration (g) vs. Output Voltage (V) (± 15g)

Annexure-I: Major Specifications

Accelerometer range	± 4g (standard)	± 15g (standard)
Shock survival	± 50g	± 100g
Bias voltage	5 V	5 V
Non-linearity	1% of FS	1% of FS
Sensitivity	~ 75 mV/V/g (with amplification)	~ 10 mV/V/g (with amplification)
Cross-axis sensitivity	< 5% of FS	< 5% of FS
Transduction mechanism	Piezoresistive	Piezoresistive
Bandwidth	DC – 100 Hz	DC – 500 Hz
Resolution	10 mg	100 mg
Temperature	-20 to 85 °C	-20 to 85 °C

Accelerometer Module

Technology Details

Name of the Lab: CSIR-CEERI, Pilani

Date: 13-5-2019

1	Title of Technology (Product/Process/Design/Equipment)	Acoustic milk analyser
2	IPR Status - Patent/Copyright/Trademark - Secured in India/Abroad IPR Details	Under patent in India
3	Application/Uses/Problem being addressed	Milk composition measurement at milk collection centres
4	Salient Technical Features including Competing Features	The rapid milk analyzer is based on sensor fusion technology i.e. IR and ultrasonic methods. The system can check fat content, protein, lactose and water content in milk within 30-35sec. It is green technology and does not use any chemical for measurement of above parameters.
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	TRL5 asper the internal TRL committe
6	Environmental Considerations, if any	No
7	Status of Commercialization	Technology transfer agreement has been signed with M/s Rajasthan Electronics and Instrument Limited, Jaipur
8	Major Raw Materials to be Utilized	NA

9	Major Plant Equipment and Machinery Required	NA
10	Techno-Economics	There are around 5 lakh collection centres and these systems can be used at each collection centre.
11	Technology Package	Hardware and software Packages
12	Contact Details	Dr. PC Panchariya Sr. Principal Scientist Signal Analytics Group CSIR-CEERI, Pilani Email: pcp@ceeri.res.in Mobile:9414743122
13	Photographs (please provide high quality photographs of proof of concept & validation)	

Technology Details

Name of the Lab: CSIR-CEERI, Pilani

Date: 13-5-2019

1	Title of Technology (Product/Process/Design/Equipment)	Handheld milk fat Tester
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	Under patent in India
3	Application/Uses/Problem being addressed	Milk fat check at home
4	Salient Technical Features including Competing Features	The handheld milk fat tester is specially designed for domestic usages. The meter can measure fat content in milk. Measures fat content from 0-7% with the accuracy of +/- 0.3%. The measurement time is 20-25 sec. It is based on NIR spectroscopy principle.
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	TRL5
6	Environmental Considerations, if any	No
7	Status of Commercialization	Technology transfer agreement has been signed with M/s Rajasthan Electronics and Instrument Limited, Jaipur
8	Major Raw Materials to be Utilized	NA

9	Major Plant Equipment and Machinery Required	NA
10	Techno-Economics	There are around households in India: ~24.5 Crore and out of which the Urban household are 6.5 Crore. Therefore, there can be possibility of 65 lakh units by considering the 10% urban households.
11	Technology Package	Hardware and software Packages
12	Contact Details	Dr. PC Panchariya Sr. Principal Scientist Signal Analytics Group CSIR-CEERI, Pilani Email: pcp@ceeri.res.in Mobile:9414743122
13	Photographs (please provide high quality photographs of proof of concept & validation)	

Technology Details

1.	Title of Technology	**Dual Energy X-ray Image Analysis Technique for Material Discrimination**

2.	IPR Status
	
	    Patent/Copyright/Trademark
	
	    Secured in India/Abroad
	
	IPR Details
		The technology know-how was transferred to:
		
		M/s. Krystalvision Image Systems Pvt. Ltd., Pune, Maharashtra.
		
		on Exclusive basis

3.	Application/Uses/Problem being addressed	➤ Market Applications
		  ❖ Security screening for airports, critical infrastructure, government offices, defence establishments, metro rail etc.
		➤ Problems being addressed
		  ❖ Checking of items in baggage
		  ❖ Highlighting of prohibited items like guns, knives, narcotics, high density material, explosives
		➤ Other uses
		  ❖ To detect impurities in products like food packets, leather goods etc.
		  ❖ To detect defects and blowholes in industrial parts

4.	Salient Technical Features including Competing Features	a) Determination of atomic number & density of scanned material items b) 16-bit grey scale image data acquisition c) Dual-energy X-ray image fusion d) Based on atomic number, the material items are labelled and displayed as 3-color & 6-color images e) Separate image processing functionalities are provided for density image, organic stripping, inorganic stripping and metal detection f) Display of density image g) High density alarm h) User-friendly graphical interface i) Hardware security enabled software j) Two identical material of similar thickness belonging to different categories can be segregated
5.	Level/Scale of Development	Technology successfully commercialized by **the entrepreneur M/s. Krystalvision Image Systems Pvt. Ltd.**, Pune, Maharashtra [*M/s.Krystalvision has success-fully commercialized & installed about 24 numbers of X-ray baggage scanners incorporating CSIR- CEERI material*

|		
		discrimination software to many clients across the country during 2017-2018]
6.	Environmental Considerations, if any	None
7.	Major Raw Materials to be Utilized	N/A
8.	Major Plant Equipment and Machinery Required	Manufacturing facility that includes - fabrication, electrical assembly, electronic assembly and software development infrastructure and resources Atomic Energy Regulatory Board approval for production, AERB certified lab, people and equipment.
9.	Techno-Economics (Broad)	N/A
10.	Technology Package (IPR, Process etc.)	Technology know-how document
11.	Photographs (please provide high quality photographs of proof of concept & validation)	As shown below

Dual energy X-ray baggage scanner

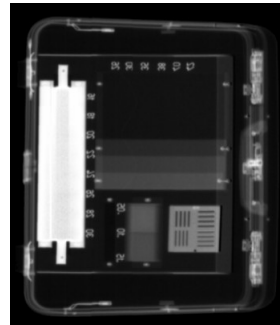X-ray material discrimination software integrated with baggage scanner

Dual-energy image processing results
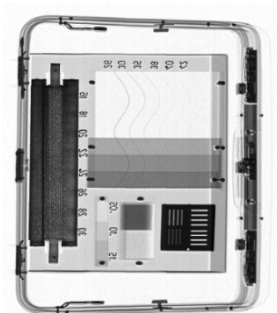
Fused image of Combined Test Piece (CTP)
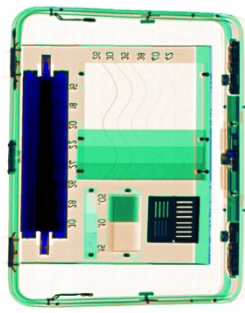
3-Color image of CTP

Density image of CTP

Technology Details
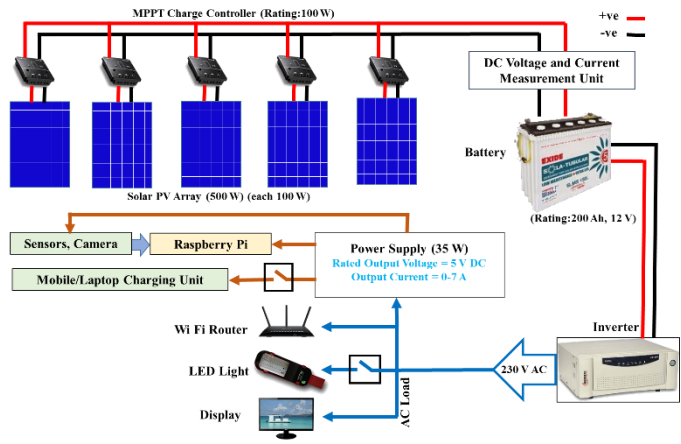
Name of the Lab: CSIR CEERI

Date: 10/05/2019
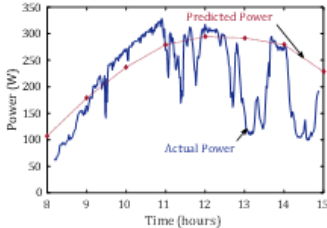
1	Title of Technology (Product/Process/Design/Equipment)	**IoT enabled Smart Solar Tree** Product
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	In preparation
3	Application/Uses/Problem being addressed	The use of solar Photovoltaic (PV) technology is increasing rapidly owing to the huge demand for energy especially in the urban areas. Solar PV installations require approximately 8-10 m^2 of land per kW of installation. In order to meet the energy demands of the urban dwellings, there is a dire need for a solution with high energy density. In addition, with the large scale grid integration of renewable energy sources, grid stability has become an issue. Hence, it is desirable to achieve a relatively uniform energy generation from solar PV installations throughout the year. Also, due to the large transmission losses and curtailment, there is a need to move toward decentralized energy generation. Solar tree offers an attractive solution to decentralized power generation with the feasibility to tune the annual solar power generation curve as per the requirement. Commercially available solar tree are not optimally designed and are said to have large shading losses of 20-30%. Solar tree is developed as a decentralized energy generating unit that can find application in a multitude of areas like smart cities, agricultural lands, border security areas, highways and so on for distributed sensing, surveillance and other application specific requirement.
4	Salient Technical Features including Competing Features	The novel indigenous solar tree is optimized for each geographical location with extremely low shading losses (<2%)[1]. Conventional solar installation are usually done at latitude tilt orientation facing south for locations in the northern hemisphere and vice versa.

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[1] Sumon Dey, Madan Kumar Lakshmanan, Bala Pesala," Optimal Solar Tree Design for Increased Flexibility in Seasonal Energy Extraction," Renewable Energy, 125, pp 1038-1048 (2018). https://doi.org/10.1016/j.renene.2018.02.017

		However, studies have shown that based on actual solar insolation pattern for a location, latitude tilt might not be the optimal orientation. Also, surface azimuth angle must be considered while deciding on the orientations. Therefore, design of solar tree is based on actual solar insolation data driven approach to optimize the orientation of solar panels. In addition, multi-objective optimization is carried out to ensure low structural cost while maintaining the energy output of the solar tree. The solar tree is designed to withstand a wind speed of 150 kmph. An additional novelty of the developed solar trees is the integration of IoT framework for continuous performance monitoring, environmental parameters, pollution monitoring (Temperature, Humidity, CO_2, $PM_{2.5}$, PM_{10} etc.), and cameras for security and surveillance. IoT enabled solar trees is an excellent platform for Smart cities. In addition, the inherent decentralized power generation capabilities of the solar tree along with integrated LED lighting, Wi-Fi, mobile charging makes it an attractive solution for smart villages. IoT enabled solar tree can also cater to the needs of the agricultural community in providing electricity for solar powered agricultural pumps and IoT enabled features can enable precision agriculture, ubiquitous soil health monitoring and smart fencing.
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	**TRL 5 (CEERI), the commercializing industry has developed the technology further to TRL>6** CSIR-CEERI has developed and installed two 500 W IoT ready smart solar tree at CSIR-CEERI, Pilani. Compared to the commercial designs where shading losses are as high as 30%, the designed solar tree reduces the shading losses to less than 5%. The designed solar tree has ground footprint of only $0.25 \, \text{m}^2$. Also, a 3 kW solar tree has been installed at CSIR-CEERI, Chennai for integration with electric vehicle charging station and performance comparison with commercially available solar tree. The 3 kW solar tree occupies a ground footprint area of only 1 m^2 and is estimated to produce 5-6 MWh of energy per annum.
6	Environmental Considerations, if any	The solar trees are installed at CSIR-CEERI, Pilani in Sep. 2017. The solar tree is operational till date. A full scale 3 kW_p solar tree consisting of 10 number of 300 W solar panels has been installed at CSIR-CEERI,

		Chennai done in April 2019. Detailed performance testing of the prototype is currently going on. The design of solar tree is such that shading losses are minimal during peak insolation periods. The developed product is environmental friendly and hold potential to mitigate the effects of global warming by reducing carbon footprints. A 3 kW solar tree is estimated to produce 5-6 MWh of energy per annum leading to ~ 4000 $kgCO_{2e}$ of carbon emission savings. The technology will act as an enabler in fulfilling the national solar targets of 100 GW by 2022.
7	Status of Commercialization	The IoT enabled solar tree design for Rajasthan has been non-exclusively transferred to M/s. Star Rising Private Limited.
8	Major Raw Materials to be Utilized	The solar tree consists of multiple solar panels oriented in different directions. The structure of the solar tree is made up of mild steel. The solar panels are mounted on an assembly for manual adjustment of solar panel orientations. The battery bank and inverters are housed in a box. The IoT module is developed using raspberry pi which acts as a server for data collection from various sensors.
9	Major Plant Equipment and Machinery Required	The solar panels are connected to individual maximum power point trackers (MPPT) which are connected to the battery. Inverter connected to the battery converts the DC power to AC and is used as supply to various loads connected to the system as shown in Figure 1. Solar tree integrated with IoT hardware is capable of real-time pollution monitoring and security surveillance. Figure 1. Schematic diagram of 500 W solar tree system .

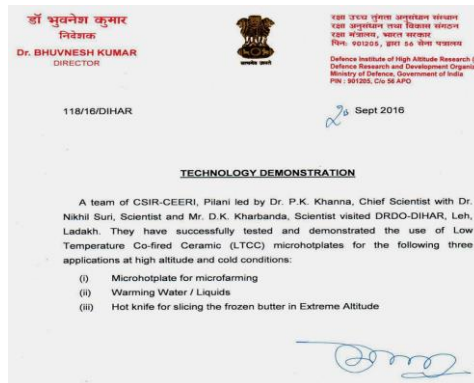| 10	Techno-Economics	The solar tree system offers huge savings in terms of land use which can be utilized for other useful purposes. This high energy density power source (3 kW/m^2) costs <1.5 lakh/kW. The solar tree along with the IoT feature can be a suitable solution for decentralized power generation at places where there is space crunch.
11	Technology Package	The solar tree consists of solar panels, structure for the solar tree, power electronics components and various IoT sensors for real time solar tree performance monitoring and for monitoring various environmental parameters.
12	Contact Details	Dr. Bala Pesala Principal Scientist, CSIR-CEERI Email: balapesala@gmail.com Ph. No.: 044-2254-4589
13	Photographs (please provide high quality photographs of proof of concept & validation)	Figure 2 and Figure 3 show the installed 500 W solar tree and 3 kW solar installed at CSIR-CEERI, Pilani and Chennai respectively. Figure 2. 500 W solar tree at CSIR-CEERI, Pilani Figure 3. 3 kW solar tree installed at CSIR-CEERI, Chennai Figure 4. Remote monitoring dashboard Figure 5. Actual and predicted power output from solar tree over a day

Figure 6. Environmental parameters collected over a period of 4 months

Figure 4 shows the dashboard displaying the solar tree performance, security surveillance camera and the environmental parameters. **Error! Reference source not found.** shows the performance of 500 W solar tree over a day. The experimental results match well with that of predicted results using analytical calculation. The power generated by the solar tree on a particular day is predicted based on data obtained from Meteonorm database. The trend of the predicted and actual power generation is similar over a day. The deviations in the power level are due to fluctuations in the solar irradiance. Figure 6 shows environmental data collected over a period of 4 months.

Technology Details

Name of the Lab: CSIR-CEERI

Date: 14-05-2019

1	Title of Technology (Product/Process/Design/Equipment)	Thick Film hotplate Integrated Microfarming Unit
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	S.K. Bhatnagar, W. Gust, P.K. Khanna, E.J. Mittemeijer, S. Sommadossi, A process for preparation of metallic paste and its use in diffusion soldering, Patent No. 224578 granted on 18.10.2008, Country: INDIA
3	Application/Uses/Problem being addressed	Thick Film hotplate Integrated Microfarming Unit: *Microfarming* is a technique to grow tiny plants. These plants are source for providing *required nutrients* and water content to the **Jawans of Indian Army** (Fenugreek , Chinese Radish , Moong , Cabbage) Certificate of Successful demonstration shown below:
4	Salient Technical Features including Competing Features	

Parameter	Specifications
Hotplate Technology to be used	Thick film technology
Temperature to	15-20 °C

			be maintained inside unit	
			Hotplate Temperature	70-90 °C
			Operating Voltage	12 V DC
			Customization	To be customized for microfarming application in high altitude cold region
5	Level/Scale of Development (*Please mention TRL rating as per attached guideline*)		TRL -5 (Assessment by Internal TRL cte. of CSIR-CEERI)	
6	Environmental Considerations, if any		These developed hotplates are rugged and reliable. They are suitable for high altitude and cold climatic conditions. They have societal as well as strategic applications	
7	Status of Commercialization		Two Units of hotplate integrated microfarming unit disseminated at DRDO-DIHAR, Leh and Changla. Amount of Rs. 10 lakhs approx. received.	
8	Major Raw Materials to be Utilized		1. Screen Meshes 2. Screen Forming Materials 3. Screen Cleaning Materials 4. Potting Compounds 5. Alumina Substrates 6. LTCC Tapes 7. Different Inks for patterning 8. Diamond Tools 9. Wires, Leads 10. Supplies	

		11. Batteries
		12. Temperature & Humidity Recorder
		13. Temp Control Unit
		14. Hotplate Holder
9	Major Plant Equipment and Machinery Required	1. UV Exposure Unit
		2. Screen Frames
		3. Screen Printer
		4. Ovens
		5. Furnace
		6. Reflow Solder machine
10	Techno-Economics	A project is economically feasible as the expected benefits will accrue to the broad community and are greater than the cost of undertaking the project. Thick Film technology is rugged and reliable. It can withstand at extreme harsh weather conditions. It is a low-cost substrate technology.They has low production costs for medium and large quantities. It is the preferred substrate solution 1. High Temperature Exposure Resistance 2. Environmental resistance over extremes. Hotplates fabricated using this technology can be customized for specific applications.
11	Technology Package	Technology Package Includes: ⬥ Know How Document
12	Contact Details	Dr. Nikhil Suri Advanced Packaging Group CSIR-Central Electronics Engineering

		Research Institute, Pilani-333031
13	Photographs (please provide high quality photographs of proof of concept & validation)	Photographs Shown Below

Required temperature of 18-20ºC was maintained inside the microfarming unit

Microfarming Unit

Plants Grown with the help of Hotplates

Hotplates arrangement inside the microfarming Unit

Technology Details

Name of the Lab: CSIR-CEERI, Pilani

Date: 13-5-2019

1	Title of Technology (Product/Process/Design/Equipment)	Handheld milk adulteration Tester (Ksheer Tester)
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	Under patent in India
3	Application/Uses/Problem being addressed	Adulteration check in milk at home
4	Salient Technical Features including Competing Features	System can check adulterants like urea, salt, detergent, caustic soda, ammonium sulphate etc. The system has applications in Domestic uses and limited milk sample testing. The system can check milk sample in 20-25 sec with no recurring cost (testing charge).
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	TRL6
6	Environmental Considerations, if any	No
7	Status of Commercialization	Technology transfer agreement has been signed with M/s Rajasthan Electronics and Instrument Limited, Jaipur
8	Major Raw Materials to be Utilized	NA
9	Major Plant Equipment and Machinery Required	NA
10	Techno-Economics	As synthetic adulteration in milk has become a major health hazard for all sections of society - including children and elderly, the system will serve the cause of public health by mitigating these hazards. The impact on public health is therefore likely to be very significant. Also the system will spawn indigenous manufacture, marketing and deployment of systems thereby generating gainful employment and revenues. There are around households in India: ~24.5 Crore and out of which the

		Urban household are 6.5 Crore. Therefore, there can be possibility of 65 lakh units by considering the 10% urban households.
11	Technology Package	Hardware and software Packages
12	Contact Details	Dr. PC Panchariya Sr. Principal Scientist Signal Analytics Group CSIR-CEERI, Pilani Email: pcp@ceeri.res.in Mobile:9414743122
13	Photographs (please provide high quality photographs of proof of concept & validation)	

CEG TEST HOUSE
AND RESEARCH CENTRE PVT. LTD.

No. 492981

TEST REPORT

Format No.: QR/26
Revision No.: 03
Report No.: CEG/FA/17-18/12797, 12798, 12799

Date: 27/01/2018

1.	Name & Address of Customer	Director CSIR-CEERI Central Electronics Engineering Research Institute Pilani-333031 Rajasthan
2.	Reference No.	Your TRF Dated 17.01.2017 (Reg. No. 86203, 86202, 86201)
3.	Material Identification with Details	KSHEER-TESTER: 1 Nos. Sample-A - Raw Milk: 500ml Sample-B - Packed Milk: 500ml×2 Nos
4.	Source / Location	-
5.	Date of Sample Receipt	17/01/2018
6.	Date of Sample Tested	17/01/2018 to 19/01/2018
7.	Sampled by /Condition of Sample	Customer / O.K.
8.	Environmental Conditions:	Room Temperature (°C): - Relative Humidity (%): -

RESULTS By Ksheer-Tester)

Sr. No.	Name of Test	Method of Test	Sample-A: Raw Milk		Sample-B: Packed Milk		Unit
			Aduterated	Pure	Aduterated	Pure	
1	Detergent (0.2g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
2	Caustic Soda (0.2g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
3	Hydrogen peroxide	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
4	Boric Acid	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
5	Sodium bicarbonate (0.2g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
6	Urea (0.1g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
7	Salt (0.2g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-
8	Ammonium sulphate (0.2g)	By Ksheer-Tester	Fail	Pass	Fail	Pass	-

RESULTS (By Chemical Test)

Sr. No.	Name of Test	Method of Test	Sample-A: Raw Milk	Sample-B: Packed Milk	Unit
1	Detergent	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
2	Caustic Soda	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
3	Hydrogen peroxide	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
4	Boric Acid	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
5	Sodium bicarbonate	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
6	Urea	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
7	Salt	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-
8	Ammonium sulphate	FSSAI Lab Manual Milk and Milk Products – 2016	Absent	Absent	-

** End of the Report**

Page No. 1 of 1

Vishal Jhelum
(DGM-Tech.)
Authorized Signatory

Note:
- Total liability of this laboratory is limited to the invoiced amount.
- The results listed refer only to the tested sample and applicable parameters. Endorsement of Product is neither inferred nor implied.
- This Test Report shall not be reproduced wholly or in part and can not be used as an evidence in the court of law without written approval of M/S CEG TH & RC.
- The sample will be stored up to one month (in case of nonperishable items only) from the date of issue of test report unless otherwise specified.
- Sample(s) not drawn by M/S CEG TH & RC, unless specified in the report.

Rajiv Gandhi National Quality Award - 2013 | National Award - MSME 2012, Govt. of India

Technology Details

Name of the Lab: CSIR-CEERI

Date:

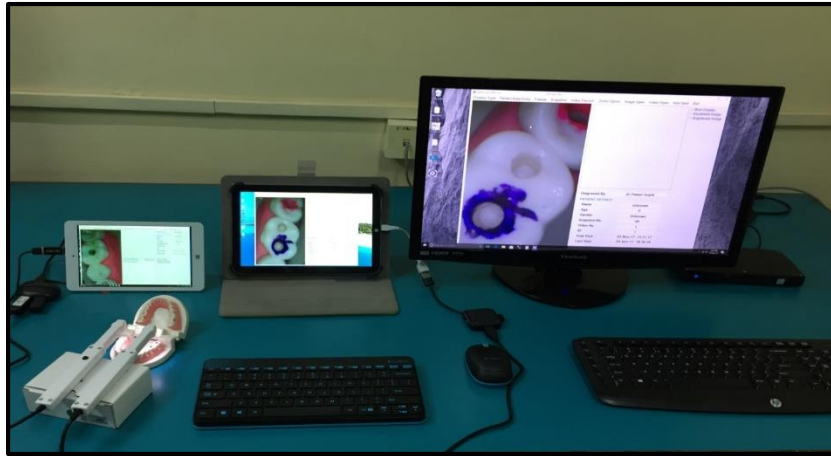| 1	Title of Technology (Product/Process/Design/Equipment)	**Development of 3D Rigid and Flexible Endoscopes for Denture Examination (MLP0101)**
2	IPR Status • Patent/Copyright/Trademark • Secured in India/Abroad IPR Details	**NIL**
3	Application/Uses/Problem being addressed	• **3D endoscope for dental examination.** • **Saving the 3D videos from the examination for future use, such as for follow-up exams or for consult with other Doctors.** • **Zooming the selected area for detailed, magnified view of dental and soft tissue structures in the mouth.**
4	Salient Technical Features including Competing Features	• **Live display of 2D/3D output** • **Patient database creation and retrieval** • **Sharing of patient database with other Doctors/Medical Practitioner** • **Snapshot & Video storage in both 2D/3D format** • **Zoom (2X) Feature in the selected area for detailed, magnified view** • **Load and Display of stored patient data in form of images and videos** • **Footswitch operated snapshot capture**

		• **Brightened View of Teeth**
5	Level/ Scale of Development (*Please mention TRL rating as per attached guideline*)	**TRL-06**
6	Environmental Considerations, if any	**Works under normal environment**
7	Status of Commercialization	**Technology will be transfer through NRDC and we are also in contact with some industries**
8	Major Raw Materials to be Utilized	**Camera (for image acquisition), White Led (for light illuminance)**
9	Major Plant Equipment and Machinery Required	**PC or Tablet with Windows OS either (64 or 32 bit) and 3D screen with 3D glasses for seeing 3D view**
10	Techno-Economics	**3D endoscope for dental application is not available at national and international level. Two versions are being developed. First version gives a true stereo view using two cameras whereas the second version gives the synthesized 3D view with depth perception using only a single camera, a unique idea, so that the overall cost can be reduced. Further, both the variants can also be used as normal 2D endoscope.**
11	Technology Package	**2D/3D display, patient database, 3D image and video save**
12	Contact Details	**J L Raheja**

		Chief Scientist **Group Head: Control & Automation Group** **Scientist in-charge Project Management - PMBD** **CSIR-CEERI** **Pilani - 333031** **Ph. +911596245291 +91159625244** **Fax: - +911596242294** **Email:-** jagdish.raheja.ceeri@gmail.com
13	Photographs (please provide high quality photographs of proof of concept & validation)	**Dental Scope HD Prototype with poor LEDs** **Dental Scope FHD Prototype with additional LEDs Light**

2D View	3D View	

2D View on Tablet   **3D View on 3D Screen**