



VISHWAKARMA
UNIVERSITY
Maximising Human Potential

Established as a State Private University
under the Government of Maharashtra.



**TRANSFORMING
IDEAS INTO REALITY**

ABOUT ECO CAMPUS INITIATIVE AT VISHWAKARMA UNIVERSITY:

The EcoCampus initiative at Vishwakarma University uses its campus as a 'living laboratory' for research and development of new technologies.

The Vishwakarma University campus spans across 22 acres and has more than 9 buildings. Apart from academic (lecture theatres, laboratories) and administrative buildings, the commercial outlets add to the diversity of the building typology on the campus. Some new building are being added to the campus that allows eco friendly technologies to be integrated in the buildings right from the design and planning stage.



Prof. Kailas Patil,
Ecocampus@VU Director,
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Under Eco- friendly initiative at Vishwakarma University, the following 5 research projects have been undertaken and completed in collaboration with Energy Research Institute at Nanyang Technological University, Singapore.

01 MARKET STUDY ON THE PV SOLAR PANELS COATING

Nano coating on solar panels to improve efficiency

Faculty List:

Prof. Amol Randive | Prof. Sandeep Gajendragadkar | Prof. Sandip Kulkarni

Student List:

Kulkarni Vaidehi Vivek | Pathak Niraj Anil | Snehal Patil | Aditya Shendge
Undale Harshada Vijay | Vasnani Bansi | Burud Sheetal | Navgare Sarvesh
Munot Anand

Goals and Objectives

1. To know the awareness of PV solar panels coating.
2. To identify problems faced by the household users.
3. To understand feedback of customers about solar panel coating.

Methodology Used

- Research Design: Descriptive
- Source of Data: Primary Data
- Data collection method: Survey
- Survey instrument: Questionnaire
- Population: Household users of PV Solar Panels within Pune city
- Sampling Method: Convenience Sampling
- Sample Size: 100

Results Obtained

Results expected by the end of January 2019.

Beneficiaries of the Project

Customers, Intermediaries, and Manufacturers of PV Solar Panels.



02 ENERGY AUDIT

Project Faculty Team

Maya Kurulekar | Mrunmai Ranade | Dr. Siddharth Jabade.
Dr. Yogesh Despande | Dr. Kailash Patil | Nilesh Jadhav.

Student List:

Atharav Joshi | Yash Suryavanshi | Niyati Khandelwal | Akash Mundada.
Hritik Bagane | Jhanvi Pandya | Pratik Hawal | Paksham Sharma.

Goal and Objective:

- Benchmarking and a case development in Commercial, Industrial and Educational buildings in India.
- Arrive at the performance insights for the above case Studies.
- Implementation of IES VE Software.

Methodology:

There were 3 case studies taken under consideration for the Energy Audit project. Traditional Auditing has always been a profound exercise performed by enterprises, all over the Virtual Energy Audit is the Exercise to simulate, a energy case study in such a manner that it becomes Optimized, Self-Efficient and Energy conservation Asset. This is a field which is a Green Career Option and has a prosperous future ahead. Hence the Virtual Energy Audit was the Audit method chosen for this Project.

IES VE Software was the tool used for this project



Results:

- 1) Academic Building (Vishwakarma University Main Building).
2. Commercial Building (Suyog Center-Trust Office).
3. Industrial Building (Aakar Foundry).

Shown below are the models created for the simulations in the IES VE Software.



Beneficiary of the project

Students, Faculty of Vishwakarma University and the Accomodaries of the considered Case Studies were the Beneficiaries from the Energy Project.

Achievement

A research paper was written on the basis of the results obtained from the case studies, which is published in the IEEE Xplore. Faculty Members and Students later presented the paper in the International Green Building Conference held in Phuket, Thailand (October 2018). Paid Internship were offered for three students by the IES VE India Pvt Ltd.



Carrying out Market Research for Self-power smart sensors to develop Business Model guiding successful entry into the Indian market.

Spider Sensor is an Ultra-Low power Wireless Multi sensing flexible hardware platform. It is a single platform that incorporates temperature sensor, pressure sensor, accelerometer, gyroscope, luminosity sensor, magnetometer, proximity sensor, etc. It is an energy harvesting sensor thus does not require an external power source. The sensor can transmit the sensed data using wireless communication.

Projects Faculty team

Prof. Niranjan Kulkarni – C&M | Prof. Pranav Dhaneshwar – S&T

Goal and objectives of the project

- To evaluate Market Landscape.
- To validate relevancy and value of the product to the customers.
- To understand customer readiness about Self-power smart sensors

Methodology used

- Review of Literature (Manuals, Brochures, Web Content, Articles, Prior Research etc.)
- Secondary Data Interpretation (Google, Online Databases, Industry Reports etc.)
- Qualitative in-depth Expert Interviews (Competitors, Customers, Channel Partners)

Activities carried

- **Market Landscape:** Studying Market size (current and future), Market volume (demand), Environmental Analysis – External (PESTEL), Identifying market opportunities and risks (current and future).
- **Customer Readiness:** Identifying Target Audience (Industries, Sectors, Domains, Functions etc.), Segmentation, knowing customer readiness at different levels (awareness, knowledge, initial interest, preference over competing products, suitability to purpose, purchase intention etc.)
- **Competitor Setting:** Identifying Competitors, Competitor Products, Product Profiles, Customer Base.
- **Marketing Mix Insights:** Identifying features appropriate to customer requirements, availability, quality and other aspects, Studying Distribution channel, understanding cost structure - Value chain model, Knowing market profitability, Commenting on resources and ability to achieve economies of scale.

Outcome

- Area identified for the survey was the newly developed and developing townships around Pune where there is a perfect combination of domestic and commercial premises.
- Early adopters were found very much excited & interested to use these sensors to understand their capabilities.
- It was observed that the cost of ownership is too high as compared to existing sensors in the market but as compared to its capabilities it was found worth installing
- Early adopters were interested in reviewing the result in real life scenario.
- Due to non-availability of Sensors at our end we could not deploy them for testing.
- Based on the information provided to early adopters they were found very satisfied with the product but unless we can exhibit the outcomes, they were not interested to install or buy the product.



04 REPORT ON SOLAR NANO COATING PROJECT

Nano coating on solar panels to improve efficiency

Faculty List:

Sandip S Kulkarni | Mrunmai Ranade | 3. Kaustubh Utpat

Student List:

Pravin Chaudhai | Akshay Giram | Ritwik Mane

Objectives:

Testing the nano coating on solar panels in Indian environmental conditions
Objectives achieved: Nano coating was tested on 10 Solar Panels in campus. 3% increase in power output was observed. The coating vanishes after one rainy season.

Methodology:

We coated 10 solar panels with nano coating prepared by “Salus nanotechnology” in an array of panels. Coating was done on 26th May 2018.

- Stick marks were observed on few panels.
- Water droplet test of hydrophobic nature of coating was satisfactory.
- 2 coated and 2 uncoated panel were tested for power.
- One panel is recoated on 13th November to observe performance.

Result:

3% increase in power output was observed on 2 panels Dust patches were observed on coated panels on 16 June only on coated panels
After 4 months it was observed hydrophobicity of panels was reduced.

Beneficiary:

Roof top solar systems

Achievements:

3% increase in power output was observed. (Sample size was very small)

Conclusion:

The coating material was tried and tested in Singapore. But, in Indian dusty environment and in comparatively heavy rains, its life is for small time span. So, modifications are required for making coating sustainable in Indian environment.



05 ENERGY EFFICIENCY AUDIT SERVICES IN INDIA

Market Research and business model study on virtual audit services for buildings in India guiding successful entry into the Indian market.

Faculty List:

Prof. Sandhya Nair – C&M | Prof. Ashish Thite – C&M

Goal and objectives of the project

- To evaluate Market Landscape.
- To validate relevancy and value of the product to the customers.
- To understand customer readiness about Virtual Audit Services•

Methodology used

- Review of Literature (Manuals, Brochures, Web Content, Articles, Prior Research etc.)
- Secondary Data Interpretation (Google, Online Databases, Industry Reports etc.)

Activities carried

- Market Landscape: Studying Market size (current & future), Market volume (demand), Environmental Analysis – External (PESTEL), Identifying market opportunities and risks (current and future).
- Customer Readiness: Identifying Target Audience (Industries, Sectors, Domains, Functions etc.), Segmentation, knowing customer readiness at different levels (awareness, knowledge, initial interest, preference over competing products, suitability to purpose, purchase intention etc.)
- Competitor Setting: Identifying Competitors, Competitor Products, Product Profiles, Customer Base.
- Marketing Mix Insights: Identifying features appropriate to customer requirements, availability, quality and other aspects.

Outcome

- The Energy Service Companies market in India needs conjunctive actions on the policy and the business fronts. A composite approach of Awareness Building, Market Enablement and Business Facilitation has to be unleashed
- Early adopters were found very much excited & interested to use these services to understand their capabilities.
- The Business-driven enablement will start with Facilitation activities that include Project assistance on the technological, business and financing fronts.
- This will be carried out alongside creation of technology specific standardisation approach for solutions, eventually maturing into a Certification process that includes accreditation / incubation of Energy Service Companies and Energy Service Companies solutions.
- The Technology-driven enablement will aim to create benchmarks through analytics of energy consumption data and audit reports, which will further enable the creation of a cloud-based benchmarking tool for end users and a report generation tool for auditors, culminating into the creation of a B2B & a B2C marketplace for energy efficiency in India based on an open collaborative framework.



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