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MESSAGE

It is one of the mandates of the Ministry of Micro, Small and Medium Enterprises (MSMEs) to promote sustainable industrial development, pave the way for job creation & employment generation. Various programs for skill development, nurturing of start-ups and initiatives under “Make in India” programme have been taken up to further strengthen the MSMEs.

Ministry of MSME is working with UNIDO on GEF funded projects to promote energy efficiency in MSME sector and has also taken initiative for implementation of Global Cleantech Innovation Programme (GCIP) in the country. This project aims at identification and promotion of clean technology innovations in the realm of SMEs & Start-ups. The project has contributed significantly towards the promotion of clean technology innovations on energy efficiency, renewable energy, waste to energy and water efficiency that address some key challenges which SMEs and Indian society are facing by providing solutions that are unique, cost effective and economical.

This e-book which is the third in the series, is the compilation of the innovations in the field of Cleantech nurtured in 2017, which have been identified and mentored under the programme which is a important resource to learn about the depth, breadth and quality of Cleantech innovations occurring in the Indian SME sector as well as challenges being addressed by these innovations.

I hope this e-book will encourage professionals, policy makers, financial & academic institutions and researchers to understand, create and encourage many more valuable innovations on the application of clean technologies in the MSME space across various sectors.

(Giriraj Singh)
Over the past years, the continued partnership between the Government of India and the United Nations Industrial Development Organisation (UNIDO) has led to strengthening of the country’s industrial, energy and environmental sectors. As UNIDO promotes Inclusive and Sustainable Industrial Development among its member states, innovations in clean technologies have recently emerged as low-cost solutions for addressing energy and environmental issues in developing countries.

The Global Cleantech Innovation Programme (GCIP) was designed for small and medium sized industries to leverage the powers of innovation and entrepreneurship to mitigate some of the most pressing energy and environmental problems with support provided by the Global Environment Facility (GEF). UNIDO is implementing GCIP in eight countries namely India, Malaysia, Pakistan, South Africa, Thailand, Turkey, Morocco, and Ukraine.

GCIP India was launched in May 2013 in partnership and with the support of the Ministry of Micro, Small and Medium Enterprises (MSME). Over the past four years, GCIP India has reached out to more than 750 innovators in clean technology, developed relationship with 90 mentors representing several Indian institutions. The Cleantech Open (USA) is the knowledge partner of UNIDO in this programme and has built the capacity of the entrepreneurs to “de-risk” their innovation in the process of commercialization and provided them a global platform for exchange of ideas and learnings. MSME Ministry entrusted one its autonomous bodies, the Institute for Design of Electrical Measuring Instruments (IDEMI) in Mumbai, to conduct another - fourth - programme round in 2017 to conclude the GCIP-India journey.

GCIP programme has been successful in showcasing entrepreneurs who have developed innovative clean technology solutions and provided the much-needed hand-holding support as they start their journey to bring solutions in the market and sustain and grow their businesses. At the closing of this innovative programme, we are pleased to have in India a team of motivated cleantech entrepreneurs, mentors, investors and various partner organizations such as Alliance for Energy Efficient Economy, National Research Development Corporation, Federation of Indian Chambers of Commerce and Industries and Institute for Design of Electrical Measuring Instruments, which have helped to grow GCIP in India.

The active interest taken by the Ministry of Micro, Small and Medium Enterprise (MSME) in programme implementation demonstrates Government of India’s keen interest in promoting cleantech innovation as many innovations that have emerged under this programme are being actively deployed among industries and various other sectors across India.

GCIP globally, has been able to demonstrate that innovative clean technology solutions are effective to address local energy and environmental challenges faced by developing countries. Clean technology solutions developed by the entrepreneurs have amongst others been presented in the annual Conference of Parties of the UN Framework Convention on Climate Change and efforts are underway to create a global coalition of efficient solutions which includes cleantech innovations that have been nurtured in GCIP.

As the 4-years of GCIP-India comes to a close, this e-book ‘Cleanovators Volume-III’ presents the innovative solutions that emerged from the fourth and final round to global audience and demonstrates how Indian start-ups and MSMEs are actively pursuing new ideas that make good business sense whilst also mitigating global environmental concerns.

Rene Van Berkel
UNIDO Representative
UNIDO Regional Office in
PREFACE

The emerging challenges on the environmental front underline the importance of innovative business models and eco-friendly industrial processes with scientific work culture. In order to address the issues relating to inclusive growth and sustainable development, it is essential to follow integrated eco system for development approach. Cleantech programme taken up by the Government of India in collaboration with UNIDO & GEF is an important initiative towards this end. The learnings from the experiences under this initiative, however, indicate the need for greater synergy in the development efforts with regard to clean energy, green cover, water and waste management.

Technology start-ups are known for developing and commercializing innovations to meet the requirement of different stakeholders and for generating substantial value for the investors. From research to commercialization, the life cycle of high-impact technologies goes through several players including the governments, universities, investors and multi-national corporations. At the center of this matrix is the entrepreneurial start-up, the vehicle for taking an idea from the lab to the market.

This e-book showcases the winners of the GCIP India 2017 and is the third volume of the “Cleanovators” series. Earlier series of Volume I & Volume II in last three years showcased the teams of 2014, 2015 & 2016 programmes and was a great success in terms of spreading information about the innovations in the ecosystem in ready to use format. This book is a handy resource of innovations of clean technology currently being fostered under title programme in energy efficiency, waste-to-energy, renewable energy and water efficiency. I congratulate the entire team of the Office of Development Commissioner (MSME), IDEMI, Mumbai and UNIDO who have worked very sincerely on this programme.

RAM MOHAN MISHRA
(Additional Secretary & Development Commissioner, MSME)
Government of India

New Delhi
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“We are creating an innovative, global programme supporting small- and medium-sized enterprises by leveraging the Cleantech Open’s global platform with UNIDO’s international network and resources.”

Dr. Naoko Ishii
CEO and Chairperson
Global Environment Facility (GEF)
Introduction

The UNIDO Global Cleantech Innovation Programme, started in 2011, is focused on enhancing emerging cleantech startups and developing a local entrepreneurial ecosystem and policy framework in six countries: India, South Africa, Thailand, Turkey, Morocco and Pakistan. A competition-based approach is used to identify the most promising entrepreneurs across a country, whilst a local acceleration program supports, promotes and “de-risks” the participating companies and connects them to potential investors, customers and partners. As the best cleantech startups progress through the Cleantech Platform, they are continuously trained, mentored and assessed. The very best startups from each country are brought together for the finals of the Global Competition in Los Angeles, California, where they can both compete for the Global Prize and connect with potential partners, customers and investors from around the world.

Global Cleantech Innovation Program India (GCIP India)

In May 2013, the GEF UNIDO Cleantech Program for SMEs, also called GCIP India, was launched in New Delhi led by the Ministry of Micro, Small and Medium Enterprises (MSME) and the national executing agency, the Federation of Indian Chambers of Commerce and Industry (FICCI). GCIP - 2017 was coordinated by the Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai under the guidance of Ministry of MSME and UNIDO’s India Country office in New Delhi. GCIP India has been focused on promoting clean energy technology innovation and entrepreneurship in selected SME clusters across India through a cleantech innovation platform and competition. In course of four years the GCIP in India has received 767 applications, and supported 89 clean technology innovators with the help of 102 mentors.

The MSME sector in India plays a vital role in the Indian economy, contributing 45% of manufacturing output, 40% of exports and employing more than 69 million people. Tackling climate change and seizing the economic opportunity for green industry requires increased design, deployment and scaling of innovative clean technologies by SMEs across India.

Through new collaborations across disciplines and sectors, the GCIP India programme aims to build the national capacity for clean technologies and develop a supportive local entrepreneurial ecosystem for SMEs developing clean and resource efficient innovations. An important aspect of this Cleantech Innovations platform is the ability to connect with other synergistic initiatives and entrepreneurs in countries around the world. Through the growing community of national partners in the GEF UNIDO Global Cleantech Program, selected Indian Cleantech entrepreneurs will be connected to potential partners around the world.

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Innovator Profiles

Innovation Name:
A green and clean technology for the production of Omega-3 fatty acids from cheapest and one of the richest sources

Company:
Aspartika Biotech Pvt. Ltd.

Product applied to:
Human and Animal Nutraceutical and cosmeceuticalsector

Industry, Innovation Area:
Biotechnology, Nutraceutical

Short Description:
Silkworm pupa oil from discarded pupa of silk reeling industries enriched with 30-70% omega-3 fatty acids for human and animal nutraceutical /cosmeceutical application. Additionally, Omega-3 fatty acids enriched poultry feed supplement to provide world's most nutritious egg

Contact Person:
Mr. Srinivas B V
Email: aspartika.india@gmail.com
Website: www.aspartika.com
Telephone: +91 9538730365

Technology/Science:
Omega 3 fatty acid enriched silkworm pupa oil for nutritional and cosmetic application, focused on the concept of sustainability and clean technology. A novel poultry feed supplement comprising the above to produce Nutritive Eggs.

Technology Validation:
Silkworm pupa comprises of 30% oil which is rich in (30-75% of the oil comprises of omega3 fatty acids.) The de-oiled cake obtained of the removal of oil comprises of 68% protein which can be used for animal nutrition applications. This technology has been validated by various national and other accredited laboratories. The novel formulation of omega 3 enriched poultry feed supplement is being validated by Hassan Veterinary college by conduction of field trials in controlled environment. Analysis conducted and validated at TUV-SUD-Bangalore, IICPT-Thanjavur and ICAR-NIAN, Bangalore, ICT Hyderabad.

Patents/Intellectual Property Right:
Indian Patent filed for the process of obtaining Omega-3 fatty acid through green technology. The formulation of poultry feed supplement to enhance Omega-3 fatty acid in the Egg is being kept as a trade secret. The patent will be filed after completion of the field trials.

Problem:
India is the 2nd largest producer of silk in the world and only 20% of the raw silk is converted to silk. Remaining 80% is discarded as waste. This comprises of silkworm pupa which is a big concern as it causes health hazard and environmental pollution. On the other hand, there is a severe mal-nutrition in pregnant/lactating women, infants and children.

Solution:
The Company intends the reclamation of this discarded pupa and development of Omega-3 fatty acids enriched silkworm pupa through a clean technology by utilizing the discarded silkworm pupa.

Market Opportunity:
Omega-3 fatty acids, protein powder from cheaper and highly enriched source for human nutrition, cosmetic and animal nutrition application.

Target Customers:
Human nutraceutical industries, Cosmetic industries and Animal Nutrition industries majorly poultry and aqua.

Competitive Advantage:
Omega-3 fatty acid from the cheapest and richest source with consistent quality at affordable prices for all. Highest content of omega-3 fatty acids for infants, pregnant lactating women and geriatric population. Designer eggs enriched with omega-3 fatty acids and other micro-nutrients at affordable price.

Strategic Partnership:
Silk reeling industries for supply of discarded pupa, Poultry federations and farmers, Nutraceutical industries using omega-3 fatty acids for paediatric & geriatric population and Cosmetic industries

Company:
Aspartika Biotech Pvt. Ltd. was incorporated during March 2015 which was formed to commercialize the PoCs established through BIG scheme of BIRAC (DBT). The company is currently supported by GoI and GoK under the BIPP-BIRAC scheme & Idea2PoC scheme respectively. The company is also supported by SBI-SME Branch Peenya, Bangalore with a term loan of 120 lakhs under CGTMSE Scheme.

Achievements/Awards/Recognition:
1) In-House R&D unit is recognized by Department of Scientific and Industrial Research (DSIR-GoI)
2) Winners in Bio-Pitch, organized by RBL bank and 1 Crowd
3) Represented India Pavilion in BioTech Japan at Tokyo supported by GoI
4) Company's invention selected as one of the top 74 innovation by I3-CII during 2015 & 2016
5) The company guided academic projects won the best project of year for two consecutive years by Karnataka State Council for Science & Technology (KSCST)
6) Recipient of BIG Grant (GoI), BIPP Grant (GoI), Idea2PoC Grant (GoK), CGTMSE Bank loan

Media Traction:
1) https://www.facebook.com/aspartika.india/
2) www.aspartika.com
3) https://youtstory.com/2017/05/idea2poc-biotech-funding-startups/
4) Twitter: https://twitter.com/abplbengaluru
Innovation Name: Rooftop Solar System with Smart Nano Grid & DC Appliances

Company: BASIL Energetics Private Ltd.

Product applied to: Solar Energy

Industry, Innovation Area: Energy Efficiency and Renewable Energy

Short Description: Super Efficient DC appliances (Air Con, Fridge, Fan & Lights) with a smart Nano Grid provides quality power at a greatly reduced Capital Cost and operating Cost.

Contact Person: Dr. R. RAMARATHNAM

Email: rramarathnam@basilenergetics.com

Website: www.basilenergetics.com

Telephone: + 91 9282170292

Technology/Science: DC Appliances, Smart Grid, Distributed Generation and IOT.

Technology Validation: Done for the system in about 45 test marketing sites. Fan has been tested by Global LEAP and the refrigerator is under their testing scheme.

Patents/Intellectual Property Right: Proprietary algorithms for motor controls and temperature controls, smart nano grid, MPPT, etc. One international patent and more are being planned.

Problem: Reliability & Quality of grid power is a problem in rural areas, including Tier 2 & 3 towns and villages. Energy costs also play an important role in the rural folk’s life. In addition there are a large number of people who still have no access to electricity. Socially and from environment angle, India uses fossil fuels for 85% of their electricity production.

Solution: BASIL’s solution totally eliminates the above mentioned problems. The appliances are super efficient and have zero starting current for motorised loads. This results in drastic reduction of the power of the solar plant. Rooftop area is also reduced. This more than compensates for the increased price of the appliances. The quality and reliability of power is excellent, both in solar, battery or grid power mode. Feedback of excess generated power is also provided for in permitted utilities. Energy consumption during non solar hours is also drastically reduced (by more than 50%).

Market Opportunity: It has been verified by a consumer survey in rural areas that there is huge serviceable market for the solution. Tier 2 & 3 towns and adjoining villages have great potential. In addition the solution is also gaining traction in suburban areas adjacent to big towns, cities and metros. In addition Africa offers excellent opportunities.

Target Customers: Affluent households in rural and suburban areas.

Competitive Advantage: Greatly reduced CAPEX (50%) and OPEX (75%). Field upgradability. Total energy security for the households. IOT ready for building automation.

Strategic Partnership: Looking for channel partners to sell, install, commission and service the systems. Training will be provided.

Company: Incorporated as per Indian Companies Act.

Achievements/Awards/Recognition:

1. MMA CavinKare award for best innovation in 2016.
2. Entrepreneur with social consciousness - Action for India, 2015
4. Winner of ‘Climate Solver’ award by WWF, 2017

Media Traction: Several reports in print media (The Hindu, Times of India) and social media sites.

Twitter: @
**Technology/Science:** Chemical coagulation based process with pre, post treatment & sludge handling. PLC based operation. Grey waste water is recycled multiple times with consistent treated water quality.

**Technology Validation:** Our technology is validated by testing the treated recycled water quality in-house as well as in external NABL accredited laboratory. Pollution control board official and customers have given us testimonials based on last 20+ month’s successful plant operations.

**Patents/Intellectual Property Right:** IP (Patent Number 261355)

**Problem:** Waste water management is a problem of industries that require huge quantities of fresh water for washing/processing applications. Effluent treatment plants (ETP) installed by many industries often require large space, skilled manpower, high maintenance & continuous attention. The treated water can seldom be reused due to inconsistent output water quality.

**Solution:** Automated, compact, energy efficient ETP with consistent output quality requiring minimum manpower and supported with excellent after sales service.

**Market Opportunity:** Recycling waste water with our ETP results in 66% reduction in fresh water purchase.

**Target Customers:** Car wash industry, 2 wheeler & commercial vehicle washing centres, engineering industries such as auto ancillary, electroplating, paint booth, food processing industries, industrial canteens, hospitality industry, housing societies, malls etc.

**Competitive Advantage:** Small size, automated operation, consistent quality, reliable working, negligible maintenance, prompt after sales service support

**Strategic Partnership:** Investors & Joint ventures

**Company:** Cerulean Envirotech Pvt Ltd is an Indian owned company incorporated with an interest of treating & recycling water. It uses a patented chemical treatment process that recycles 90% waste water. This process is integrated in a compact ETP which is automated and customizable. The product and underlying technology are sustainable with respect to materials used for manufacturing and process.

**Achievements/Awards/Recognition:** -

**Media Traction:** -

**Twitter:** -
Chakr Innovation is a company founded by engineers from IIT Delhi in 2015. With an aim to develop innovative solutions to solve the problem of pollution, the company currently produces pollution control devices to control particulate matter (PM) emissions from diesel generators and converts the captured residue into ink.

**Contact Person:** Kushagra Srivastava

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Website: www.chakr.in

Telephone: +91-8447407349

**Innovation Name:** Emission Control Solution

**Company:** Chakr Innovation

**Product applied to:** Diesel Generators

**Industry, Innovation Area:** Emission Control Technology and Circular Economy

**Short Description:**
Chakr Innovation is an award winning innovative technology that reduces emissions from diesel generators using particle coagulation via thermophoresis and subsequent capturing through contours and solvent. It is a retrofit device which offers several advantages: meets Pollution Control Board emission mandates with minimal back pressure and efficiency loss, as well as, improves ambient air quality; improves environment and health of the local population; helps achieve corporate sustainability goals and green building ratings. Moreover, we do not just dump or burn off the captured carbon. As carbon is a useful resource, we process the captured particulate matter and use it to create ink pigment.

**Technology/Science:** Is an award winning innovative technology that reduces emissions from diesel generators using particle coagulation via thermophoresis and subsequent capturing through contours and solvent. It is a retrofit device which offers several advantages: meets Pollution Control Board emission mandates with minimal back pressure and efficiency loss, as well as, improves ambient air quality; improves environment and health of the local population; helps achieve corporate sustainability goals and green building ratings. Moreover, we do not just dump or burn off the captured carbon. As carbon is a useful resource, we process the captured particulate matter and use it to create ink pigment.

**Technology Validation:** The performance has been approved by accredited Government agencies. Certified by NABL accredited laboratories for 90% emission reduction, without any adverse impact on engine. Currently, Chakr Shield is operational at over 30 sites with leading telecoms like BSNL, MTNL, ATC, Reliance and FMCG companies like DS Group, Educational institutes like IIT Delhi and commercial complexes in NCR with successful operations. Also, the pigment is non-toxic (as certified by another third-party lab – Appendix B) and is of same quality as the ink used in industries.

**Patents/Intellectual Property Right:** Indian patent filed in Jan 2016.

**Problem:** Ambient air pollution is a leading cause of deaths, with an estimated 3 million deaths per year. Emissions due to combustion of fossil fuels consists of particulate matter (PM10 and PM2.5), are known to cause lung cancer, COPD, ischemic heart disease and stroke. Moreover, PM emissions contribute extensively to radiative forcing due to absorption of radiation and by settling on the glacial ice caps and reducing the albedo. PM also has indirect effect by changing cloud formation patterns and contribute heavily to climate change. The carbon dioxide equivalent of PM is ~460, which means that PM has ~460 times the adverse impact as compared to that of carbon dioxide.

While the sources of air pollution are scattered, it is clear the diesel exhaust are a major contributor to PM10 and PM2.5 emissions. Moreover, the particulate matter released from diesel exhaust has been classified as Class I carcinogen by IARC (WHO). Diesel generators contribute to ~16% of PM2.5 in Delhi and thus are a major source of pollution. The norms and guidelines on emission standards exist, but people were unable to meet these norms in the absence of an efficient technology.

**Solution:** Chakr Shield is a device which can be retrofitted on diesel generators and can capture ~90% of particulate matter emission. Created using a novel solution based method, it is a one of its kind device which controls pollution without causing any adverse impact on the engine’s performance or the environment. It also has lower energy consumption and operational cost as compared to other technologies.

**Market Opportunity:** The current product is applicable for anyone and everyone who uses diesel generators. The domestic installed capacity for diesel generators is 80 GW, which for our product is a market size of ~2 Billion INR ($29 million). The market for diesel generators is expected to grow at 5GW per year, which means a CAGR of almost 6%. Global market size for diesel generators is estimated to be $23.9 billion and growing at a CAGR of 6-7% till 2025. This would mean a market size for ~$1.6 billion for us (as our target cost is 7-10% of DG cost).

**Target Customers:** The market can be segmented into two broad categories – organized and unorganized. We are focusing only on the organized sector, with following drivers for each industry:

- Manufacturing - Sustainability & Health, Regulations
- Real Estate - Green Incentives and Regulations
- IT and Telecom - Sustainability & Health, Regulations
- Banks - Sustainability & Health, Regulations
- Retail - Sustainability & Health, Regulations
We have already generated traction worth INR 50 lakhs from sales to FMCG, Real Estate and Education Institutions.

**Competitive Advantage:** Whenever a product needs to be designed for retrofit on diesel generators or any other engines, there are two very important parameters namely back pressure and energy consumption apart from the efficiency of the pollution control equipment. We are able to capture emissions by consuming <1% energy, with back pressure less than 600 pascals, which is 10 times less than competing technologies giving similar efficiencies.

**Strategic Partnership:**
- Grant and R&D support to develop device for refinery by IOCL
- Selected for DNA Accelerators Program by BOSCH India with R&D and mentorship support

**Achievements/Awards/Recognition:**
- Forbes 30 Under 30 Global, Social Entrepreneurs, 2018
- Urban Labs Innovation Challenge, University of Chicago - Winner
- American Society of Mechanical Engineers - Top 3 start-ups
- General Atlantic Echoing Green Global Fellowship, 2017: Winners
- MIT GSW (Global Startup Workshop), 2016: Runners up
- Global Sourcing Council 3S Award for Climate Change at the United Nations
- India Innovation Growth Program by Department of Science and Technology, Government of India and Stanford Business School, 2016: Second Runners up

**Media Traction:**
http://in.one.un.org/blogs/turning-diesel-soot-ink/
http://www.thebetterindia.com/98169/delhi-chakr-innovations-diesel-soot-ink/#
http://www.asianage.com/life/more-features/010517/a-chakr-that-recycles-pollution.html
https://www.youtube.com/watch?v=ttdOVBvfx4U&feature=youtu.be
https://www.youtube.com/watch?v=ttdOVBvfx4U&feature=youtu.be
https://www.youtube.com/watch?v=X_vSZ_4wYYc&feature=youtu.be
https://www.facebook.com/hindustantimes/videos/10155471945978580/
https://www.youtube.com/watch?v=FyCxisvrYGU
https://www.facebook.com/quintillion/videos/833937860106737/
https://www.youtube.com/watch?v=a2QGsU8_yIM
**Technology/Science:** Electric mobility

**Technology Validation:** By IIT Bombay

**Patents/Intellectual Property Right:** Patented by IIT Bombay

**Problem:** Even after 70 years of freedom Women and men are carrying loads on their head for their sustainability and livelihood with no technology support to offer the solutions. In the process they suffer physically as well as financially.

**Solution:** Offering electric vehicle based, safe, eco-friendly inexpensive, logistic system, with cutting edge technology that can be self driven by females, can carry about 100 Kg of cargo and can give them payback period of 17-122 days depending upon other incentives that they can avail.

**Market Opportunity:** The estimated size of the segment is about 50,000 eTRIKE for the fisheries segment and 30000 e TRIKE for the milk collection. The Rupee value for these both markets would be Rs. 4000 million. In addition Food delivery in urban semi-urban areas is going to be a substantial segment.

**Target Customers:** Association of fish vendors, dairy farmers and people doing food deliveries like Mumbai dabbawallas including State fishery departments

**Competitive Advantage:** No cargo vehicle is available in the range of 100 kg carrying capacity. eTRIKE - electric(polution free) vehicle can give the buyers, payback period between 17-122 days. We are the first one offering mentoring / hand holding services through the vehicle ownership for optimum utilisation, so that such deprived segments amongst our customers can be empowered for their sustainability and livelihood

**Strategic Partnership:** Technology partner IITB & CTech Labs Pvt. Ltd. FAME (Ministry of heavy Industries) for demand incentive for the green technology. Ministry of Food Processing for cold chain. Govt agencies for contributions to the dairy and fisheries industry. KVIC for the PMEGP support. National Fisheries Forum for their existing relationship with fisherwomen NDDB/Dairy Co-operatives for their existing relationship with the dairy farmers. Advisors and consultants. Signed an MOU with NFF for vehicle delivery and support.

**Company:** ECOEV India Pvt. Ltd

**Achievements/Awards/Recognition:** Recognised as a Startup Company by Govt. of India, having fulfilled all the criteria. Invited by UN to show case eTRIKE on UN Day event (Clean Energy) in New Delhi on 24th Oct. 2017 as a

**Media Traction:** Media coverage in News papers in W. Bengal, Pondicherry and Maharashtra. Launch of the vehicle during NFF function at Pondicherry where fishing community was present along with CM Pondicherry, minister and other local dignitaries. Vehicle was selected for display at UN Delhi on UN day 2017. Vehicle was test driven by the Dairy and Fisheries Minister Maharashtra during the dairy exhibition in Pune in Oct 2017

**Twitter:**
Technology/Science: Jaggery making heating systems using our unique combustion technology. Proposed tech for steam based jaggery making.

Technology Validation: One furnace based system of 10 TCD (tons crushing per day) will be working from 15th December.


Problem: Excess wastage of bagasse and therefore increased carbon emissions. Almost 50% more bagasse is required for making jaggery.

Solution: 50% savings in bagasse leads to savings of Rs. 4000 per day for the farmer. And reduction of 3350 kg of CO2 emissions every day.

Market Opportunity: Around 1000 customers in Maharashtra alone. And 4000 more across India.

Target Customers: Farmers with 10-20 TCD cane crushing capacity.

Competitive Advantage: Hi efficiency heating system and also the complete package.

Strategic Partnership: With crushers and other equipment manufacturers

Company: Flamingo Industries

Achievements/Awards/Recognition: Aee- Startup of the Year award-2017

Media Traction:
Agrowon article on the Company
Twitter: Flamingo Industries

Innovation Name:
High efficiency furnaces using the waste heat recovery systems for bagasse savings of 50% in fuel costs

Company:
Flamingo Industries

Product applied to:
Jaggery making for farmers.

Industry, Innovation Area:
Jaggery making furnace and other heating systems

Short Description: Patent for the combustion technology has been applied already. We have sold similar furnaces to the food processing industry in the last few years. So we have trials and actual readings of the product and its efficiency. Third party certification for the same shall be done this month.

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Website: www.flamingoindustries.com
Telephone: +919922755577
**Technology/Science:** Green Form EPS is a Sustainable Energy Efficiency Booster from Polymer (Polystyrene). Glorifac is the trade name for Polymeric Resin (Virgin) and end Product is Green Form (Granted Patent) used as an insulation foam. Green Form replaces, imported Virgin grade, insulated concrete form ICF and red clay bricks, with an enhancement of melt flow index in Polystyrene and molecular weight in Expandable Polystyrene.

**Technology Validation:** Pilot installation, Obtained reports from CIPET, Dubai Central Laboratory & Rheology Test Report from Germany.

**Patents/Intellectual Property Right:** Patent granted in India: Certificate No. 281850

**Problem:** Traditional Red Brick manufacture, consumes fertile top soil and post curing causes environmental air pollution and buildings account for appx. 40% of the global energy usage.

**Solution:** Glorifac Green Form’s provides an energy efficient solution which is brick replacement enabling. Energy conservation up to 75 % Water Saving & Acoustic Properties along with ergonomics, that empowers EPC teams to achieve aggressive energy goals on a budget with the implementation of the Green Form ICF.

**Market Opportunity:** Huge growth in demand for energy efficient buildings foreseen in India. A potential market of INR 15,000 crore including residential and commercial buildings - new construction buildings in India, with a backward integration to Styrene Monomer Factory.

**Target Customers:**

- Residential Buildings (Affordable Housing) : “GreenY HomeS”
- Commercial Buildings as Super-specialty hospitals, Cold Storages,
- Educational Institutions, Cyber Parks, Cineplex Malls & Coastal area
- Customers, who have a mandate to built sustainable buildings.

**Competitive Advantage:** Reduced time, Energy efficient, cleaner process, savings up to 75 % in air conditioners usage with an effective cost reduction measures.

**Strategic Partnership:**

- EPC Players and Building Solutions providers.
- Polymer Manufacturers for Licensing Patented Technology.

**Company:** Green Form’s Private Limited Registered Company, incorporated on 29 February 2016 at New Delhi Region, India.

**Achievements/Awards/Recognition:**

- Start up India Recognition DIPP 956.
- First Green Building in Visakhapatnam : Andhra Pradesh, India.

**Media Traction:**

Youtube: https://www.youtube.com/watch?v=p4G8ns5f2uk
**Innovation Name:** Vahann

**Company:** Lithos Motors Pvt. Ltd.

**Product applied to:** Last Mile Logistics

**Application Industry, Innovation Area:** Clean Tech

**Short Description:** Vahann is an Electric Bike specially designed and Manufactured for Last Mile Logistics Services like for example, delivery boys’ of food delivery chains like Faasos, Domino’s, Pizza hut and Courier services like DTDC, Blue Dart, Amazon, Indian Post etc.

**Contact Person:** Angad Singi

Email: angad@lithosmotors.com

Website: www.lithosmotors.com

Telephone: +917387555755

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**Technology/Science:** Vahann is equipped with advanced Li-ion batteries which can provide a range of 100 km on a single charge, and can charge in 3 hrs. It is also equipped with real time vehicle tracking system which records every minute movement of the bike.

**Technology Validation:** We have done a two week trial with the Faasos (The Food Delivery Company), in which they had done around 100 deliveries with our bikes and saved a significant amount on operation and maintenance. As a result of this, they have placed the order of 12 bikes with our company.

**Problem:** Reducing operation cost of Last Mile Logistic Companies along with the carbon footprint.

**Solution:** With Vahann Logistic companies can save around 14 Rs/Delivery with zero on-road pollution.

**Market Opportunity:** Let us just consider only food delivery market. Food delivery industry is nearly around 15 bn$ market. The average order value is 6.17$. Therefore, no of orders are 2 bn per year. Now, a delivery boy makes about 13 deliveries per day. So all that costs the total addressable market for us is approximately 450 Mn$.

**Target Customers:** All Courier companies and food delivery companies.
Patents/Intellectual Property Right: Under Process

Problem: The current offering for passenger transport on water using diesel boats causes air and water pollution. The noise and vibration is very tiring for the passengers. In addition, the smell of diesel is uncomfortable. But the biggest problem is the high operating cost due to inefficient design and diesel cost. This is also the case in cargo transport.

Solution: Our solution, solar ferry, do not have any problems of pollution (air or water), it has low noise and vibration and no smell of diesel. Most importantly the daily operating cost is $1/40 of diesel ferry (for a 75 passenger ferry compared to 7000 Rs. for diesel our boat has just 163 Rs.)

Currently, our boats have 20% higher CAPEX which with 22 lakhs annual fuel savings will break-even in three years. However, with scale, when we build our twentieth boat, in a year from now, the CAPEX will be similar.

Market Opportunity: There are about 5,000 ferry boats in India. Every year about 500 are built because phasing out old ones and additional demand of similar number. This is a fast-growing market since the potential of water transport is just started to tap. From the average price of 3 Cr, the target customer sub segment is 3000 Cr. This year we will hit 5 Cr. We hope to build twenty boats and about 50 Cr revenue in three years from now.

Target Customers: Our prospective clients are in transportation and tourism industry both government and private using boats. Our solar ferry offers a sustainable transport both from environment and economics. In addition our boats do not cause any pollution (air, water), they are silent and without vibrations and smell of fuel. All lakes, rivers and inland water bodies has potential for passenger transport and tourism. Many areas would open up since our boats have better ROI.

Competitive Advantage: We have proven technology for building solar ferries in India. Our competitors are diesel ferry manufacturers. It is not possible for them to match our environmental (no air or water pollution) or comfort (no noise, vibration, smell of fuel) parameters. Our OPEX is also very low. Hence our solar boats are better, cleaner and cheaper boats.

Strategic Partnership: We have a technology partnership with EVE Systems, France.

Achievements/Awards/Recognition:
* PM awards for social innovation 2017
* FICCI R&D catapult award 2017
* TieCon Entrepreneur of the year 2017
* Top 5 in Hello Tomorrow global challenge 2017, 2016
* INK Fellow 2017
* Winner of Action For India Silicon Valley Trek 2017
* Outlook Traveller: http://bit.ly/2zXSFf9
* Channel I'M: http://bit.ly/2BFl5b1
* Twitter: https://twitter.com/navaltboats

Media Traction:

Innovation Name: Solar Ferry Boats
Company: NavAlt Solar & Electric Boats
Product applied to: Inland Passenger water transportation
Industry, Innovation Area: Marine, Transportation
Short Description: We build solar ferry boats which are better, cleaner and cheaper
Contact Person: Sandith Thandasherry
Email: sales@navaltboats.com
Website: www.navaltboats.com
Telephone: +91 484 2543609
Technology/Science:
1. Naval Architecture
2. Efficient underwatershape
3. Efficient & reliable power train
Technology Validation: First solar ferry in India is sold to Kerala Government and it has been operating for the past 11 months and carried over 400K people. Vessel is certified by International Register of Shipping (IRS). We have signed a repeat order with same client and they plans for rolling out 10 similar ferries

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Contact: Sandith Thandasherry
Email: sales@navaltboats.com
Website: www.navaltboats.com
Telephone: +91 484 2543609
**Technology/Science:** The Ceramic membrane technology for separation process, which is chemically (2-12pH), Thermally (5°C to 150°C) & Mechanically (up to 15 bar pressure) extremely stable (compare to polymer membrane) with more than 10 years life.

**Technology Validation:** Reserve Bank of India is one of our satisfied customer, Publication in national and international forum. Since launch (Jan, 2017) sold over 500 units. Need immediate expansion to meet the current niche demand.

**Patents/Intellectual Property Right:** We have our proprietary know-how and own the trade mark- KERASIEV® Ceramic Membrane

**Problem:** Filtration in chemical process industries were carried out in an extreme chemical and thermal environment. Conventional process (clarifier, settling etc) are inefficient and outdated. Polymer membrane/filter are not durable at that extreme condition. It has very short life span. International Ceramic membrane are very expensive to implement in developing and under developing countries for small and medium players

**Solution:** Low cost, indigenous high efficiency KERASIEV® ceramic membrane, which has life of more than 10 years

**Market Opportunity:** The estimated ceramic membrane market, with existing high international price, is $5.1 billion by 2020 with 44% market share by the south-east Asia. Currently there is only one manufacturer of similar product apart from Need Innovation in the ASEAN countries, which is very expensive. We understand the size is much more with our technology/affordability.

**Target Customers:** Following are application customers in our priority:
1. Protein separation & Bio-tech industries
2. Chemical extraction, Ink manufacturer
3. Novel metal recovery
4. Distillery & Pharmaceuticals
5. Textile
6. Dairy
7. Water Treatment

**Competitive Advantage:**
* 1/10th the cost of available ceramic membrane (filter)
* Reduce the cost of ownership by 10 times
* Nationally available- only manufacturer till date in the country.

**Strategic Partnership:** Investor and collaborator

**Company:** Need Innovation is a Hi-Tech Ceramic process/design developing company with passionate designer, engineer & scientist guided by board of eminent scientific and industry veterans. The company has developed and commercially introduced the first of its kind economical ceramic membrane technology in India for filtration application across the spectrum; From water filtration to waste water recycling, refinery to dairy, pharmaceutical to distillery at a very affordable cost reducing the cost of ownership to less than 1/10th.

**Achievements/Awards/Recognition:** Need Innovation received 1st Prize in Industry-Academia conclave March, 2017 (Govt. of WB)

**Media Traction:** Facebook & linkedin followers
Twitter: @NeedInovation,
Facebook page: @kerasiev
Technology/Science: Integrated organic nitrifying and denitrifying bioreactor for Recirculating Aquaculture Systems (RAS) with a specific bacterial consortium delivery system that converts: 1) Ammonia (NH₃) and ammonium (NH₄⁺) to nitrite (NO₂), 2) Nitrite to nitrate (NO₃) and 3) Nitrate reduced to molecular nitrogen (N₂).

Technology Validation: The technology has been tested and validated at the facilities owned by Rajiv Gandhi Centre for Aquaculture, located at Gopalpur on sea and Sirkazhi, and Tamilnadu Fisheries Development Corporation at Aliyar. Trials on a smaller reactor has been conducted in multiple locations. Trials: 1) Shrimp grow-out, 2) maturation & larval rearing, 3) ornamental fish & 4) Seabass fingerling
Validation: Water quality maintained: NH₃< 0.2ppm | NO₂< 0.2ppm | NO₃< 1.16ppm

Patents/Intellectual Property Right: (1) Patented in India (No. 241648) and South East Asian Countries. (2) PCT application submitted in Thailand, Japan, Philippines, Indonesia & South Korea

Problem: Recirculating aquaculture system (RAS) is a technology for fish rearing at controlled environment with high densities. The worldwide market for RAS is estimated at USD 21 billion. To create a condition for high survival and fast growth of fishes, one of the essential requirements is to remove the harmful nitrogenous waste namely Ammonia, Nitrite, and Nitrate.

Solution: For units who need to treat nitrogenous waste; our company offers a Bioreactor that gets activated in 2 – 3 days; and removes ammonia, nitrites, and nitrates in the same system unlike conventional reactors that need 60 to 90 days of activation time and two separate reactors for nitrification and denitrification

Market Opportunity: According to an independent evaluation, the Water Treatment Market for Recirculating Aquaculture Systems was estimated at $7.2 billion in 2015 and is estimated to grow to $13.3 billion by the year 2030.

Target Customers: Large scale indoor tank based facilities to grow high value species. Beachhead Segment: Tropical Indoor Growout operating at 23 to 30OC, Salinity: 30-35 ppt. Species: Flounder, L. Vannamei and Asian Sea Bass

Competitive Advantage:
* Nitrification and denitrification in same system. Conventional systems require two reactors.
* Maintains optimum levels nitrogenous compounds: NH₃< 0.2ppm | NO₂< 0.2ppm | NO₃< 1.16ppm
* Operational at site within 2 – 3 days. Conventional systems require 60 days for full activation.
* Available in three different salinity levels (0ppt, 15ppt, and 30ppt).

Strategic Partnership: The company has received an offer for partnerships from a USA based RAS Solutions Provider. In the Indian Market, we have received an offer to collaborate from an Indian Seafood exporter; for indoor grow-outs in East India. We propose to work in partnership with technical project consultants and advisors on RAS.

Company: Oriental Aquamarine Biotech India Private Limited


Media Traction: NA
Twitter: NA
Technology/Science: Our system uses concentrating solar technology to store heat. This heat can be directly used for many heating applications including water desalination/purification and/or used to produce steam for electricity production.

Technology Validation: The main technology behind producing heat has been validated with a project done for TATA motors and ISRO.

Patents/Intellectual Property Right: N/A

Problem: More than 400 million people in rural India do not have access to reliable power. More than 100 million people live in areas of poor water quality.

Solution: Our indigenously built system can provide heat for rural agri industries, clean water for the rural community and electricity to these off-grid or unreliable power supply locations including islands and coastal area.

Market Opportunity: Rural electrification in India is over $100 million market opportunity. Apart from that, the cell phone towers and industrial heat requirement is over a $1 billion market.

Target Customers: Off-Grid communities, Rural/Island communities with unreliable power, Cell phone tower companies, Remote military bases, Industries with high heat requirement, NGOs

Competitive Advantage: Our solution benefits are:
1. Provides at 1/3rd the Capital cost of Solar PV with storage
2. Provides at 1/8th the operating cost of Diesel
3. Requires 1/3rd the ground area compared to Solar PV
4. 100% indigenous
5. More environment friendly than any other renewable.

Strategic Partnership: Looking for partnership with operational expertise.

Company:

Achievements/Awards/Recognition:
* WWF Climate Solver
* Global CleanTech Innovation Program 2016 Semifinalist
* SKOCH Awards

Media Traction:

Twitter:
Technology/Science: Indigenous ‘Advanced Supercritical Thermal Treatment Technology (AST3)’ incorporating the optimal use of catalyst, pressure and temperature, which makes the process unique and highly energy efficient.

Technology Validation: TIFAC via the SRJAN program
Inhouse pilot batch scale plant
Many papers/Journals from reputed institutes have validated the process and the uses of products derived from it.

Patents/Intellectual Property Right: Patent application will be filed by the end of January 2018.

Problem: First, billions or tonnes of plastic waste generated every year ends in landfills and water bodies every year creating immense environmental challenges.
Secondly, hydrocarbon reserves are limited and these need to be recycled as much as possible.

Solution: Create a circular economy by converting end of life plastic waste to synthetic fuel thus recycling the plastic and not letting it pollute landfills and waterbodies where it would lie in perpetuity.

Market Opportunity: Over a Billion Dollar in India itself, to start with, in the next few years.

Target Customers: All, industries, facilities with boilers, furnaces, and generator sets etc. which use diesel are the target customers for Rays Enserv.

Competitive Advantage: Indigenous, energy efficient technology, which provides about 25% cheaper alternate energy product which is also cleaner than conventional Diesel being used as of today.

Strategic Partnership: None

Company: Convert end of life non recycled plastic waste to ‘No Sulphur synthetic fuel’ with calorific value similar to High Speed Diesel as an alternate source of energy for Industrial applications like Generators, Boilers, Smelters etc.

Achievements/Awards/Recognition:
1. Selected among top 10 Innovations at the CII Industrial Innovation Summit 2017 under the Startup category.
2. Selected among top 12 Startups for a 12-weeks incubation program by StartupNexus - Part of American Centre New Delhi, FICCI, and University of Texas. Further selected among the top 5 for a year-long handholding.
3. Among top 30 innovations shortlisted by ONGC SINE IITB incubation program.
4. Selected among top 50 Innovations and invited for Pitch day in IIGP 2.0 by IndiaInnovates.in. IIGP is the initiative of Department of Science and technology in association with IIM-A, Lockheed Martin, Tata Trusts and FICCI

Media Traction:

Twitter:
Technology/Science: Our innovation lies in developing a proprietary process of converting banana fiber into an absorbent fluffy material making it more absorbent than regular wood pulp. We have filed for the patent. Our pads are developed in compliance with BIS 5405, the Indian regulatory standard for sanitary napkins, though this is not mandatory for commercialization. We also have national lab certificates for toxicity, microbial content and biodegradability.

Market Status: Commercially available.

Technology Validation: The product has been validated by 3rd party labs for toxicity, microbes, compostability, biodegradability & greenhouse gases.


Problem: Conventional sanitary pads are made of primarily plastic, chlorine-bleached wood pulp, and other toxins which cause some women skin irritation, rashes and in the worst case can cause cervical cancer with prolonged use. These pads are also harmful for the environment upon disposal. Plastic pads take 600 years to degrade, and worse, are frequently burned for disposal, generating CO2 and toxic fumes. With only 16% of Indian women using sanitary pads today, women in India currently generate 100,000+ tons of sanitary pad waste each year.

Solution: Saathi has developed the world’s first 100% biodegradable and compostable sanitary pad made from banana fiber to reduce sanitary pad waste and make use of more sustainable materials. Banana fiber is one of the most absorbent natural fibers and abundant in India. Our all-natural pads do not contain any bleach or chemicals which minimizes skin irritation and the release of toxins into the environment upon disposal. Most importantly, Saathi pads degrade within 6 months of disposal.

Market Opportunity: The TAM for sanitary pads in India is 42B pads, the SAM is 7B pads. The eco friendly market is 700MM pads because 10% are willing to pay a premium for eco-products. Saathi expects to capture 5% of India’s eco-friendly pad market (36MM) in 2018.

Target Customers: We have two types of customers:
1. Middle & upper class urban women in 20’s and 30’s who have sensitive skin and are environmentally conscious NGOs that purchase our pads to distribute in the villages in which they operate

Competitive Advantage: Saathi uses more sustainable materials. Banana fiber is one of the most absorbent natural fibers and abundant in India. Our all-natural pads do not contain any bleach or chemicals which minimizes skin irritation and the release of toxins into the environment upon disposal. Most importantly, Saathi pads degrade within 6 months of disposal.

Potential Strategic Partnerships: 1. Companies generating biogas or working with compost toilets; 2. Beauty box sellers; 3. Farmer cooperatives; 4. P & G for marketing campaigns and/or rural distribution

Company: Saathi is a next generation CPG company focused on sustainable product development starting with sanitary pads. Find out more at www.saathipads.com

Achievements/Awards/Recognition:

Media Traction: Facebook, Twitter, Linkedin, Instagram (@saathipads.com)


Our recent win at Hello Tomorrow in Paris:

Our AJ+ video about Saathi has also had more than 1.2M views on FB (see the video!)
Technology/Science: Sagar Defence builds Unmanned Marine & Aerial Vehicles. Trashfin is our hybrid autonomous vehicle system which does round the clock waste collection. The solution puts no human life at risk and reduces OPEX and CAPEX.

Technology Validation: Our product has been validated in labs for its design, software and hardware and for its efficiency and functioning by our valued customers. The technology we have developed i.e ‘Boat in a box – Genesis’, has been successfully deployed to the Indian Navy which is our credibility. Using TrashFin, we have done survey and cleaning of the marine debris in a project with the eminent Vanoord at Rotterdam.

Patents/Intellectual Property Right: We are in the process of filing patent for our indigenous product.

Problem: The chief problem that we solve is providing a cost effective efficient autonomous system solution for the collection of this maritime and oceanic debris and waste in real-time using unmanned marine vehicle called "TrashFin".

Solution: TrashFin puts no human life at risk and reduces OPEX (operation expenditure) by more than 60% and CAPEX (capital expenditure) by 45%.

Market Opportunity: POTENTIAL MARKET - Serviceable addressable at $26.5B and we are looking at 12.5%.

Target Customers: Government authority, municipal corporations, Ministry of shipping, environment and climate change, Defense, Fisheries, Security & Surveillance, National oceanography institutes, National disaster management organizations, Search and rescue etc

Competitive Advantage: Hybrid system, Round the clock autonomous waste collection, Operation can be carried out with multiple boat at same time, Scalability can be fitted on any kind of vessel from 1 meter to 25 meter and above, Compact, Plug and play architecture, modular, customizable, cost effective, highly Rugged and available for all weather environment

Strategic Partnership: None

Company: SAGAR DEFENCE ENGINEERING PVT. LTD.

Achievements/Awards/Recognition: Best Maritime Start by government of India &Shipping Ministry, Best Maritime time start up by Audience Poll during Maritime India Summit 2016, one of the top 10 Maritime Startups in PORTXL- World Port Accelerator held at Rotterdam, Netherlands; Selected for the second cohort of XL8 Andhra Pradesh Technology Business Accelerator, the most promising Startup by IESA Technovation Awards 2017, Winners of disruptive technology by IC2 Lab, University of Texas, Austin, USA; the most promising Startup in Aerospace and Defence by IESA Defftronics Awards 2017

Media Traction: http://www.sagardefence.com/media/
Twitter: https://twitter.com/sagardefence

Innovation Name: TRASHFIN
Company: SAGAR DEFENCE ENGINEERING PVT. LTD.
Product applied to: Clean marine debris by collecting them efficiently with a cost effective solution providing real time data at the same time. Useful for Search and rescue operations too.
Industry, Innovation Area: Unmanned Marine Surface Vehicles, Unmanned Aerial Vehicles, Maritime, Government authorities
Short Description: The Trash Fin is large drone with an underwater “mouth” capable of gobbling up 500 kg of waste before needing to deposit it elsewhere for processing. In addition to collecting waste, it also sends back valuable data to ground authorities, including information on the quality of water, the weather, and the depth of the river/ harbor. It can be controlled through remote or it is capable to perform its tasks without any human intervention.
Contact Person: Nikunj Parashar
Email: nikunj@sagardefence.com
Website: www.sagardefence.com
Telephone: 022-28017902, 28017903, +91-9467339102
**Technology/Science:** Smartigator provides one point solution to farmers in overcoming intermittent electricity problem through solar and applies drip irrigation in a smart and optimized way with the help of an unified controller. The technology enables the farmers in huge savings of energy, water & fertilizer in addition to the increase in crop yield.

**Technology Validation:** Proof of concept is being carried out in lab scale.

**Patents/Intellectual Property Right:** Provisional Intellectual Property filed.

**Problem:** Farmers in India are hit by dual problem viz., intermittent power supply and water shortage. To overcome this scenario, concerted efforts are needed by all stakeholders to introduce new methods and means to optimize the existing resources.

**Solution:** "Solar powered drip irrigation system with smart crop tracking" - Smartigator. It is a product that combines three technologies viz. Drip Irrigation, Solar Energy and IOT. The automatic pump controller and Irrigation notification kit, driven by a signal from soil moisture probes improves the pump’s life and water efficiency beyond 95%. Smart Fertilizer injection tank help in better output by tracking the nutrition level in the soil and feeding the right fertilizer in just the right quantity.

**Market Opportunity:** In India, the net potential areas for drip irrigation are estimated to be 21.27 Million Ha. From the saving of water under drip irrigation, an additional irrigated area of 11.22 mha under Flood irrigation or 24.12 mha under drip irrigation can be created.

**Target Customers:** Farmers, tea & coffee plantations, vineyards, Landscape artists

**Competitive Advantage:** The technologies provided by the competitors are not accessible to middle range customers/farmers. Smartigator system is economically viable even for much smaller installations thus enabling the technology to enter new markets.

**Strategic Partnership:** We have partnered with Gram Oorja, Pune to access the rural market for solar & drip irrigation.

**Company:** Sys3E is a start-up focusing on the 3E’s: Energy, Environment & Ecology. The company is innovating products to solve Food, water & Energy security issues in the country.

**Achievements/Awards/Recognition:**

Finalist in XLR8AP 2017.

Media Traction:

Twitter:
Innovation:
Solar Conduction Dryer and energy efficient food drying technologies

Category:
Renewable energy and energy efficient food dehydration technology

Year Founded: 2011

Innovator:
Dr. Shital Somani (+919004408849, shital@s4stechnologies.com)

Business Description: S4S sells / rents solar conduction dryers to the farmers and also buys back the dried produce if required. S4S sells these dried products to the food industry as ingredients or as healthy snacks.

Products:
* Solar Conduction Dryer (SCD)
* Dried products from the solar dryers

Business Model: S4S sells or rents the dryers to the farmers or self help groups in the rural area. S4S reaches to these customers through the govt. agencies, NGOs, Aid agencies. It also creates rural entrepreneurs who will aggregate these dried products at the local level and supply to S4S. S4S sells these dried products to food industry.

Customers:
* For Solar conduction dryer: Farmers and SHG
* Dried produce: Food Industry

Awards & Recognition:
* Bill & Melinda Gates Foundation
* USAID
* UKAID
* Govt of India
* FICCI
* World Bank
* BIRAC

News Coverage:
Newspaper: Times of India, Hindustan Times, DNA, Free Press
TV: India TV, Zee Business, CNBC Awaaz,

Management: We are interdisciplinary team of 19 people including 6 core team members from technical, management and food dehydration background from ICT, IIT and Mumbai University.

Technology/ Know how: S4S has the national and international patents applied for SCD. SCD is also protected by trademark & industrial design. Technology is validated by MNRE, Govt of India and ICT Mumbai.

Markets: S4S targets a market of dehydrated products valued at 16 Billion USD. This market is growing at 14%. At 2nd and 3rd stage, S4S will target Neutraceutical, health ingredients and extraction market. S4S will create farm gate solar dehydration facility installed with the farmers, which will help them to reduce post harvest losses and increase their income significantly. Total expected market size for the solar dryers is 16 million units globally.

Competition: S4S has superior renewable energy based technology strengths compared with existing dehydrated food manufacturers. Existing food dehydrators spends 40% of their cost on fuel, where this cost for S4S is zero as a solar technology. Market linkages provided by S4S is a differentiating pillar vis-à-vis other dryer providers.
Dr. Nand Pal Singh is currently a Senior Technical Adviser at the UNIDO Regional Office for South Asia, New Delhi. He brings 33 years of experience in policy making with the Department of Non-Conventional Energy Sources, now Ministry of New and Renewable Energy. He was the Group Head of Small Hydro Power, Biomass Power Cogeneration, Waste-to-Energy Group, Information and Public Awareness Group and Energy Parks. He was also the Director General of National Institute of Solar Energy and Director of National Institute of Bio Energy. He has contributed to over 50 research papers on Solar Energy and Bio-energy in leading National and International Journals and conferences. He has written three books on Solar Energy and Biomass Energy. Dr. Singh was awarded an honour of Senior Adviser by UNIDO International Centre for Solar Technologies, Hangzhou, China. He has widely travelled to several countries in Americas, Asia and Pacific, Europe and Oceania continents for participating in the meetings/conferences and study tours as representative of Government of India. Dr. Singh did his post graduate degree in Physics and Ph.D. in Bio Energy. Email: n.singh@unido.org

Mr. Deepak Gadhia was the founder of “Gadhia Solar Energy Systems Pvt. Ltd”. in Gujarat, which offered services in the Energy sector. His pioneering work includes bringing to India the “Seifert Parabolic Solar Concentrator technology” and Scheffler Concentrator technology in co-operation with the developers from Germany and successfully commercialising it.

The company has undertaken prestigious projects like - the World’s largest Solar Steam Cooking System at Shirdi Temple which cooks 50,000 meals per day with steam generated from Solar Concentrators and - India’s first and largest Solar Air-conditioning plant of 100 TR which cools 160 bed hospital with steam generated from Solar Concentrators.

Gadhia Solar has received various Awards including the Blue-sky Award in Shenzhen, China as one of the Top Ten Solar Technologies in the World.

The Solar Energy Society of India (SESI) has awarded him with the “Solar Entrepreneur Award” in Solar Thermal Field.

He was Board member of “Solar Cooker International” (SCI), in USA.

Mr. Gadhia has done his Process and Environmental Engineering in Berlin, Germany and has done Master Courses in Technical University Berlin and MIT of USA.

Email: deepak_gadhia@yahoo.com

Mr. Kothari has 26+ years of wholesome foundry and industry management experience. His core strength in multidisciplinary engineering knowledge, value engineering, systems development and innovative solutions. Transforming into Social Entrepreneur and Innovator, partnering several MSME’s for horizontal business growth, and venturing into building Human Capital. He is a Mechanical Engineer from MSU Baroda with 2 Gold Medals in 1991.
Mr. Mahesh Kanumury has over 25 years of venture capital, management consulting and operating experience. He is the Managing Director & Founder of Arivali Partners where he provides advisory and investment services to for-profit social enterprises (companies with potential to become $1B+ organizations and impact 1M+ lives). Mahesh was a General Partner at a $260M early stage venture capital fund based out of the Silicon Valley where he invested and successfully nurtured the growth and successful exit of several companies. Prior to this, he worked at McKinsey, USA where he led several high-impact initiatives at the CXO level. He also led large scale, cutting edge software development projects at Schlumberger Technologies. He has an MBA from Harvard Business School, an MS in Engineering from Purdue University and BS in Engineering from IIT, Chennai.

Email: mohesh@arivali.com
LinkedIn: https://www.linkedin.com/in/mahesh-kanumury-63217/

Mr. Chandan Gadgil has been an entrepreneur throughout his career and is the founder and erstwhile owner of Innovative Environmental Technologies, a company involved in large-scale biogas based renewable energy projects. He has more than 25 years of experience especially in Biogas generation and its utilisation. He has also been a member of the National Panel on Environment of Confederation of Indian Industry (CII).

Presently he is a Hon Advisor in BAIF Research Foundation, Pune working on Rural Enterprise model, based on family size biogas plants, for the production of PROM (Phosphate Rich Organic Manure). He is also a founder president of Sankalp Trust, Pune, which is involved in promoting new and innovative ideas, especially in social enterprise in environmental and renewable energy field. Mr. Gadgil is a graduate in Electrical Engineering from University of Bombay, India.

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Lt. Col. Monish Ahuja (Retd.) is an ex-defence professional with a management profile with 20 years comprehensive experience in developing and implementing strategic projects, marketing and business development for existing business, new business development, operations and maintenance for leading companies. He was the head of business for the Bermaco Group companies in the energy sector responsible to direct, drive and manage the networking, marketing and sales effort besides project development in the RE sector.
He promoted & started the company PRESPL from the new business innovative concept idea in 2011, leading it to a $10 Million valuation in short time span of 2 years with a strong 50-member team & secured the first round of PE investment from Zurich based Impact PE fund responsAbility in year 2013.
PRESPL has been awarded the ‘Most Innovative Company in RE space award by PwC led selection Committee in the year 2015.
He is a member of the MNRE committee on Bio-energy and member of the CII committee on Bio-energy and Chairman of the CII Committee of Biomass.
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Mr. Ashis Kumar Sahu has over two decades of strategic and grassroots experience in sustainable energy, microfinance, and livelihoods. He has led multiple social enterprises balancing social mission with financial viability and continues to work with young entrepreneurs as mentor, advisor, or board member. Ashis has been the Founder CEO of Clean energy Access Network (CLEAN), Selco Incubation Centre and COO of SELCO Solar Light Pvt. Ltd. and has worked previously in organisations like BASIX, Sa-Dhan and Urmul Trust. Ashis is a Chevening Gurukul Scholar from LSE and an alumnus of IRMA.
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Mr. Milind Chittawar is the CEO of SEE-Tech Solutions Private Ltd. started in 1993 to deliver sustainable energy and environment solutions to its customer. He has mentored several graduate (B.E.) and Post graduate students (MBA, M. Tech) on various projects. He is a Charter Member of TIE (The Indus Entrepreneurs) where he has been mentoring many start-ups on several aspects like technical, financial, overall feasibility of business model, etc. He is an Executive Council Member of Alliance for an Energy Efficient Economy (AEEEE), President of Association of Energy Engineers (AEEE), India Chapter and member of ISHRAE, NSC, VIA, VMA, IAPPP among others. He is an Accredited and Certified Energy Auditor by Bureau of Energy Efficiency. He is also Certified Measurement and Verification Professional by EVO-AEE, USA. For his contribution to Energy Efficiency he has received “Energy Professional Development Award 2013” in South Asia Region by AEE, USA.
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Cooking is passion for Mr. Rao who has given up an enviable career as a civil servant from Indian Revenue Service in order to pursue full-time journey to transform the eco-system of Indian cuisine. Mr. Rao has developed energy efficient radiant heat commercial gas burner system which is 30% more efficient and emits heat just like charcoal heat. The innovation works on LPG, Natural Gas, Bio-Methane or any combustible gas with higher thermal efficiency. The innovation has won several national and international awards on clean cooking. Hari Rao heads R&D in Agnisumukh, and has geared up to build the world’s largest kitchen based on knowledge, technology, design, manufacturing, sales & service platform and creates applications across gas fuel. Presently his mission is to address complete heat dynamics of clean cook stoves for commercial, domestic purposes including other industrial application as well with total automation.

Vinay Deodhar, Energy & Environment Consultant and Director Clean Tech Solutions Vinay Deodhar is a leading Consultant in the Energy and Environment management sector and Director of proprietary concern Clean Tech Solutions (CTS). He has over 33 years of experience in chemical & fertilizer industry, banking and consulting field. Vinay specializes in clean energy and climate finance. He has led teams of national and international consultants on funding, and development programs of bilateral aid agencies like USAID, KfW and multilateral agencies like ADB, World Bank. Vinay worked for ICICI Ltd. for 12 years in the Project Finance area where he appraised innovative projects in the clean energy and environment space. He has managed three projects of the USAID in India spanning a period of 15 years. These covered diverse activities such as project identification, development, due diligence, financing, capacity building/training and outreach. Vinay was the Team Leader for the Technical Support Facility under ADB’s Carbon Market Program. The TSF assisted implementing agencies of various developing member countries to identify and avail carbon finance for their projects under CDM and other market instruments. Vinay was a member of the Registration and issuance team and Accreditation Panel formed by the CDM Executive Board of the UNFCCC. He has reviewed over 400 projects submitted for registration and issuance under CDM. He has reviewed 35 new baseline and monitoring methodologies for small and large scale projects under the CDM. Vinay has also reviewed full projects under the UNDP – GEF and assisted UNIDO in the development of a PIF under GEF. Vinay has assisted several MSMEs in the development of their energy efficiency and renewable energy projects for assistance under USAID PACER project. He has also provided training to MSMEs, ESCOs and FIs for development and financing of energy efficiency improvement projects. He has also helped identification of innovative financing options/mechanisms for renewable energy devices at the Access to Energy level in Nepal. He has conducted Expert review for the Market Readiness Proposals submitted by Vietnam, a Partner developing country under World Bank Partnerships for Market Readiness (PfMR). Vinay is a Chemical engineer from the I. I. T. Bombay and has done Masters’ in Management with specialization in operations and finance from the Mumbai University. He is a Certified Energy Auditor and Manager by BEE, GOI.
Mr. Aryaman Saxena is a seasoned In-House professional and a Legal counsel on the rolls of Powergrid Corporation of India Limited. He has hands-on experience on Regulatory and Policy aspects of energy sector with special focus upon Generation and Transmission of Power apart from renewables and energy trading. Having worked with the Central Transmission Utility and handled issues of recovery of tariff, regulation of power supply, trends of generation and tariff analysis, apart from streamlining the litigation and tariff petitions for transmission assets built by POWERGRID on Cost-Plus Basis. He has also assisted in drafting open-access and connectivity agreements, structuring and formalizing terms of cross-border energy trade. He has also worked on formation of Joint Ventures of Powergrid (both domestic and bi-laterals).

He is also a pro-bono researcher at the Centre for Information Commission and helping in establishing a Centre for Research & Studies on Public Accountability and Transparency Laws, apart from mentoring the GCIP semi-finalists on issues of contracts, non-compete and non-disclosure agreements and IP Laws. He obtained a Bachelor's Degree in Law from NALSAR University of Law, Hyderabad in 2013. Email: imaryaman@gmail.com Contact No.: +917042396713

Mr. Ashok Toshniwal is Director & CEO of Universal Instruments Manufacturing Co. Pvt. Ltd. that manufactures battery chargers for power plants and substations (micro industry registered with MSME with customers in 23 countries in Asia and Africa. 32 years back he has developed high power solar controllers for installation on Offshore Oil Platforms & gas pipeline. He has electrical Engineering degree from JNU University, Jodhpur and has 32 years of working experience in power sector, including renewable energy. Over the course, he has developed various types of charge controllers for various applications, street lighting, telecom, railways signalling etc. He has knowledge in various fields & has been a Mentor since 2015. In 2015 he was Mentor of the year. He has been jury member in Ishow India Hardware Innovation program of American Society of Mechanical Engineers (ASME) & in Innovation program of Federation of Karnataka Chambers of Commerce & Industry. He is also a Mentor in Miller Centre for Social Entrepreneurship, Santa Clara University, California, USA. Email: ashoktoshniwal@yahoo.com

Sunil J. Shenoy is Founder and Director of Sunren Technical Solutions Pvt. Ltd. –Mumbai, an ISO1725 NABL accredited testing Laboratory for Telecom, Wireless, Climatic and Safety testing. An Electronics engineer by qualification (B.E. Electronics, Bombay University), he has worked in the Indian industry for over 23 years, with 5-years in design and development of image processing, facsimile systems and data compression algorithms. His work on Rockwell single chip modem programming for facsimile protocols was noted and commended by renowned modem manufacturers - Rockwell Mexico in 1991. Thereafter he has undertaken several diverse responsibilities in the areas of Product Design, Manufacturing , Sales and Technical Support. Till 1998 he was engaged as Manager-Tech Support (PAN India – IT products) for M/s Godrej & Boyce – Mimbain their electronic equipment division for managing all technical aspects in respect of new product introductions, training and dissemination of new technologies to the field and managing regulatory approvals. Sunren Technical Solutions Pvt. Ltd was founded by him in 1998. An NABL accredited ISO17025 testing Laboratory for Telecom, Wireless, Climatic and Safety testing, Sunren’s services are patronised by worldwide manufacturers and regulatory agencies for testing and certification of their products in India. Email: ashoktoshniwal@yahoo.com
Shri Ram Mohan Mishra
Additional Secretary & Development Commissioner

Mr. Piyush Srivastava
Additional Development Commissioner

Mr. Sanjay Bisariya
Joint Development Commissioner

Mr. S. V. Rasal
Managing Director, MSME-TC, Mumbai

Mr. Pradipkumar Gujarathi
Deputy Director, MSME-TC, Mumbai

In his role as the Additional Secretary to the Government of India and Development Commissioner for the Ministry of MSME Shri Ram Mohan Mishra works on comprehensive policy making for the SME sector in India. He has over 30 years of experience as an Indian Administrative Service officer having worked in the field of General Administration, Mines and Minerals, Programme Implementation, Planning, Banking and Institutional Finance, Revenue, Environment & Forests, Water Resources, Commerce & Industry, Personnel Management, Home Affairs, Land Revenue, etc. He is a Law Graduate, Masters in Geography and has studied Public Finance at Maxwell School of Syracuse University. He has been CEO of a Government company working for promoting and facilitating inclusive growth, entrepreneurship development, climate change adaptation and sustainable development.

Mr. Piyush Srivastava is from the Indian Economic Services (batch 1993), and as the Additional Development Commissioner, in the Office of the DC (MSME) he looks after the implementation of National Manufacturing Competitiveness Programme (NMCP), ZED, GIZ and ISO Schemes. He has over 24 years of experience in General Management, Policy Formulation, Scheme Formulation, Strategy, Evaluation, Economic Analysis, Monitoring and Training.

Shri Sanjay Bisariya is working as Joint Development Commissioner since November 2013 in the Office of Development Commissioner, Ministry of Micro, Small & Medium Enterprises, Government of India. He is looking after various schemes under National Manufacturing Competitiveness Programme (NMCP) such as Lean Manufacturing Competitiveness Scheme, Design Clinic Scheme, Quality Up-gradation Support for MSMEs, IPR , Digital MSME, ZED Certification Scheme & Support for Entrepreneurial and Managerial Development of SMEs through Incubators. Apart from various verticals, additionally, he is responsible for the Inter-Ministerial Coordination & Multilateral Cooperation. He manages UNIDO Projects on Market Transformation for Energy Efficiency in MSMEs, GCIP and GIZ Project for Innovation Promotion among MSMEs. He is a B.Tech. (Industrial Engineering) from IIT Roorkee. He also holds Master in International Development Policy (MIDP) from Duke University, USA. He belongs to Indian Railway Accounts Service of Government of India.

Mr. S. V. Rasal is working as a CEO & Managing Director for Institute for Design of Electrical Measuring Instruments (IDEMI), Ministry of MSME, Mumbai. He has 36 years of experience in Tool Room, Tool Design, Quality Control, Calibration & Testing, Automation, Training etc. He had worked in Automotive industry, Tooling industry, CNC & Tooling industry, Tool & Die Making industry and Calibration & Testing laboratory. He is also a Lead Auditor for ISO 9001 and ISO 17025. He is also member of BIS Committee, Metrology Society of India, NCCL-USA, TAGMA, IEEMA, Indo American Society, Indo German Chamber of Commerce. Responsible for implementation of GCIP 2017 in India.

Mr. Pradipkumar Gujarathi is working as Deputy Director in Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai under Ministry of MSME, Govt. of India & having more than 31 years of experience in energy efficiency, testing & calibration of very high precision reference standards as per international norms. He is a Lead Auditor for ISO 9001, OHSAS 18001 & trained trainer for ISO/IEC 17025. Member of Metrology Society of India, National Conference for Standards Laboratories (NCSL), IEEMA. Actively involved in the various activities of BIS, QCI, NABL, etc. Coordinated GCIP 2017 activities.

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Sandeep Tandon
National Project Manager
Sandeep Tandon has more than 29 years’ professional experience, he has been working in the area of energy efficiency and climate change for two decades in a leadership role with private firms. He has been involved in design, implementation and evaluation of large and often complex Climate Change related projects in India and other Asian countries. He has rich experience of working with private sector multinational consulting firms, state governments and International Development Agencies including UNIDO, UNDP, and USAID.

Rishabh Goel
Project Associate
Rishabh Goel is associated with UNIDO for over four years and has been working on the GCIP Programme for identification and promotion of clean technology startups. His role in GCIP involves understanding the nuances of commercialization and technology component of cleantech innovations, project management and implementation. He holds a Masters in Business Administration and a Bachelor’s degree in Electronics and Communication Engineering.