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FOOD ENGINEERING STARTUP IN SOLAR REFRIGERATION- 'CHILSOL'

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ABSTRACT

'Chilsol' is an incubation idea for entrepreneurship based startup which incorporate transfer of solar refrigeration based technology, research and development on par with recent trends and service sector. Transfer of technology section of 'Chilsol' can include the extension based activities for the popularization of solar refrigeration based technologies in rural areas. Import export section of transfer of technology wing which will be a bridge to introduce advanced technologies to our country and to showcase low cost indigenous technologies to the global market. Research and development wing will be focusing on innovative solar refrigeration technology. Service sector division of 'Chilsol' can be based onsite services for the installed solar system which is being operated in demand on call basis and mobile app based services. 'Chilsol' can provide the platform for the sellers and buyers as international level consortia where business and innovation can be discussed using the opportunities of e-commerce. Sources of income for this project can be obtained from service fee, MNRE and other government projects. 'Chilsol' will be having high outcome and impact with 2.72 BC ratio and a payback period of 2 years and 8 months. Hence this will be the best project under propagation and entrepreneurship development of low carbon technologies.

KEYWORDS: 'Chilsol', E-Commerce, Entrepreneurship, Solar Refrigeration, Startup

INTRODUCTION

India is among the world leaders in agricultural production much of our produce goes waste due to absence of proper storage facilities mainly refrigeration. Milk, fish and meat are also adversely affected due to lack of refrigeration. Usage of CFCs from present refrigeration system affected the environment adversely. Medical facilities are also adversely affected due to break in the cold chain hence the development of low cost refrigeration system is very essential India.

In principle, solar energy can be used to drive any type of refrigeration system: compression or absorption. However, in most of the cases, the direct utilization of solar thermal energy for running refrigeration systems is more efficient. Thus solar energy based heat operated systems are attractive. A solar refrigerator is a cooling appliance that is operated completely with energy harnessed from the sun. Solar-powered refrigerators are able to keep perishable goods such as meat and dairy cool in hot climates, and are used to keep much needed vaccines at their appropriate temperature to avoid spoilage.

The need for tomorrow is the refrigeration system that doesn't emit any of the CFCs which has a significant impact on ozone layer depletion which affects the atmospheric balance. Solar power in substitution helps to reduce the amount of carbon dioxide produced by the thermal power plant when generating electricity.

Startup ecosystem has been created through the new policy initiatives which would not only promote startups particularly in the manufacturing sector but also the micro units would be able to graduate faster as small and medium units. If this objective is achieved the goal of job realization through self-employment would be complete as self-employment is the answer to providing jobs to the huge proportion of population in the economically active age group. This process would be fast tracked by the flagship programs well supported by the Skill India Mission which would facilitate availability of right skilled manpower as entrepreneurs complain about skill mismatch. Given that startups are emerging as major job creators, governments both at the Centre and States need to put in place appropriate policy framework for the start-ups.

MATERIALS AND METHODS

Global Warming and India

Global warming continues to increase, and the resulting climatic disasters ravage the country in an unabated manner. This can be attributed to the lack of resources, and access to technology. To cope up with the climate change-disasters-security nexus, the country needs to have a better technical understanding, capacity building, networking and expansive consultation processes spanning every section of the society. The committees and organizations working to counteract against the climatic disasters work independently from each other. The ongoing climatic changes, with an increase in a possibility of more disasters impose imperatives for a unity among all these bodies, resulting in an integrated risk management framework, creating a common platform for the committees to work on. India has a distinctive vulnerability profile as the poor are the most affected. Tremendous weather events take place more frequently and are becoming more ruthless. Therefore the previous attempts of just rescuing the affected will not be enough now, instead, meticulous steps to prevent these disasters are required. This can only be met if the strategies and policies can cope with climate change, requiring the active participation of the government and the people.

Solar Refrigeration as a Solution

Solar refrigeration system will be a solution to the global concerns over greenhouse gases being made to produce refrigerator-freezers, which is having low energy consumption thereby cutting down the energy costs and preserves our environment. In most of the developing third world countries, adequate supplies of drinking water and water for irrigation are scarce commodity. Solar refrigeration provides refrigerated, safe to drink potable water and also to helps to keep medicine or foodstuffs from spoiling. Lack of chilling facilities severely limits the production of various products like milk and milk products. This technology gives the green solution for this problem. Advanced adsorption chillers represent one of the new technology options that are under development. This invention can improve refrigerating unit, raise coefficient of performance, reduce energy cost of refrigerating unit and has notable social and economic benefits.

Solar Electric Refrigeration

A solar electric refrigeration system consists mainly of photovoltaic panels and an electrical refrigeration device. The biggest advantage of using solar panels for refrigeration is the simple construction and high overall efficiency when combined with a conventional vapour compression system.

Solar Thermal Refrigeration

Solar thermal systems use solar heat rather than solar electricity to produce refrigeration effect.

Thermo-Mechanical Refrigeration

In a solar thermo-mechanical refrigeration system, a heat engine converts solar heat to mechanical work, which in turn drives a mechanical compressor of a vapour compression refrigeration machine.

Sorption Refrigeration

Sorption refrigeration uses physical or chemical attraction between a pair of substances to produce refrigeration effect. A sorption system has a unique capability of transforming thermal energy directly into cooling power. Among the pair of substances, the substance with lower boiling temperature is called sorbate and the other is called sorbent. The sorbate plays the role of refrigerant.

Types of Solar Refrigeration Systems

- Solar Photovoltaic Operated Refrigeration Systems
- Solar Vapour Absorption Refrigeration Systems
- Ammonia – Water Absorption Refrigeration System
- Water- Lithium Bromide Absorption Refrigeration System
- Three Fluid Absorption Refrigeration System
- Solar Adsorption Refrigeration Systems

RESULTS

'Chilsol' is an incubation idea for entrepreneurship based startup which incorporate transfer of solar refrigeration based technology, research and development on par with recent trends and service sector. Agribusiness in India is a potent field that needs to uplift by the government and hence they are brought up by government and private participation.

Transfer of Technology Section

Transfer of technology section of 'Chilsol' can include the extension based activities for the popularization of solar refrigeration based technologies in rural areas. Extension is the major area where India is lacking where we have lots of innovations in the laboratory it still lies there. .Outreach of these technologies are under shadow and they are still sleeping in files. There are lots of technologies which came as an application of solar refrigeration and these areas are focused by the chilsol solutions

Refrigerated cart: A carrier vehicle which can carry the fruits/ vegetables or related commodities which was refrigerated by the solar technology which keeps the freshness of the biological material. This will improve the quality of storage and prevents spoilage hence fetches market value. This is the main drawback of existing system of food supply chain that it cannot maintain the storage temperature of commodities hence this cart fill help to maintain the cold chain system of India.

Medicinal supply chain maintenance: solar refrigerated system helps to maintain the temperature of stored medicine which is very important for the maintenance of quality of medicine and helps to prevent the side effect of temperature variation.

Ware houses: Solar powered warehouses will create a drastic change in the field of storage and supply of warehouses. It will change the face of current supply chain of India and create energy efficient smart warehouses.

Import Export Section

Import export section of transfer of technology wing which will be a bridge to introduce advanced technologies to our country and to showcase low cost indigenous technologies to the global market.

There are lots of researches going on the solar refrigeration field in an around the world. The exposure and awareness about this is very limited among Indian situation. Lack of facilities and funds limit Indian scope of research. Import section of the 'chilsol' will try to collaborate with foreign traders and research labs to give light to trends in global research and market. It will also aim to import the suitable technology to Indian soil. Import section will be taking care of relation with the global giants in this field and try to make tie up with the Indian companies.

Export section will work to showcase the achievements of Indian research to the global level and try to up lift the indigenous technology to the global market. Technological advantage and cost effectiveness will surely attract the foreign customers.

Research and Development Section

Research and development wing will be focusing on incorporation of solar refrigeration technology for water supply, cold chain systems for storage of farm fresh produces, solar refrigeration based transportation system, and house cooling.

Water supply of rural and urban India is a dreadful scene now days. Due to heavy draught and climate change water purification and availability of cold water in scorching summer remains as a day dream for the people. The 'chilsol' will be concentrating the on supply of cold water to the needy with low cost. It will be added to the existing water purification system with cheap cost.

R & D will be focusing on development of cold chain system for the value addition and freshness maintenance of fruits and vegetable. Incorporation of existing indigenous technology to the modern imported technology will add flavours to the R&D wing. Customization of foreign technology must be done to suit the technology to the Indian scenario.

Service Section

Service sector division of 'Chilsol' can be based onsite services for the installed solar system which is being operated in demand on call basis and mobile app based services. On site services will be done by the professionals. The digital technology will revolutionize the field as like other field. Electronic media will play a key role in accelerating the services.

'Chilsol' can have village adoption program for the uplifting the under privileged villages which is the social face of this start up. Social responsibility of chilsol is to make the rural area smart with respect to urban area. 'chilsol' will act as a perfect connector to convey the recent development in the practical mode in the form of village adoption program. Installation, free maintenance and free service of chilsol will help to spread the advantages of solar refrigeration system in the soul of India, the rural villages.

'Chilsol' can provide the platform for the sellers and buyers as international level consortia where business and innovation can be discussed using the opportunities of e-commerce. E-commerce is the growing face of Indian customers. Chilsol will show its presence and act as a consortia for the trade of solar refrigeration based product and hence it can revolutionize the untapped resource with greater potential.

Economics of Startup

Sources of income for this project can be obtained from service fee, MNRE and other government projects. 'Chilsol' will be having high outcome and impact with 2.72 BC ratio and a payback period of 2 years and 8 months. Hence this will be the best project under propagation and entrepreneurship development of low carbon technologies.

Table 1: Cost Economics Cost Per Year (Rs)

CAPITAL COST		**LICENSING**	**10000**
		Furniture	50000
		Demonstration	200000
		Equipments (Lab)	100000
		Other Direct Expenses	25000
		TOTAL	**385000**
Operation Cost		Purchasing	200000
		Rent	120000
		Salary	800000
		Administrative Expenses	50000
		Selling And Distribution	200000
		Total	**1370000**
		TOTAL COST	**1755000**
Expected Income		Commission (Import)	500000
		Sales	100000
		E Business	800000
		Service Charges	100000
		TOTAL	**1500000**

Table 2: Business Plan the Investment and Return is tabulated below. It Will Help to Find Out h

	1	2	3	4	5
Capital Investment	385000				
Operation Cost	1375000	1650000	1980000	2376000	2851200
Total Cost	1760000	2035000	2365000	2761000	3236200
Income	1500000	2025000	2632500	3422250	4791500

CONCLUSIONS

It can be conclude that 'Chilsol' is an incubation idea for entrepreneurship based startup which incorporate transfer of solar refrigeration based technology, research and development on par with recent trends and service sector. Transfer of technology section of 'Chilsol' can include the extension based activities for the popularization of solar refrigeration based technologies. Import export section of transfer of technology wing which will be a bridge to the global market. Research and development wing will be focusing on incorporation of solar refrigeration technology for different services. Service sector division of 'Chilsol' can be based onsite services for the installed solar system. 'Chilsol' can have village adoption program for the uplifting the under privileged villages which is the social face of this start up. 'Chilsol' can provide the platform for the sellers and buyers as international level consortia where business and innovation can be discussed using the opportunities of e-commerce. Sources of income for this project can be obtained from service fee,

MNRE and other government projects. 'Chilsol' will be having high outcome and impact with 2.72 BC ratio and a payback period of 2 years and 8 months with following advantages

- Reduce the load of conventional fuels which are directly responsible for environment pollution.
- Eliminates the use of refrigerants like CFC, HFC etc. which are highly hazardous for Ozone.
- Reduces world energy shortage.
- Operates continuously for years as proven by prototype units tested at various locations around the world.
- Suits applications in a wide range of sizes, from portable 50-liter coolers to building-size air-cooling systems.

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