



EV CONSORTIUM
STATE EV CONSORTIUM
Conclave Series - 2023
CS-01
LTO Batteries and its BMS

Date: 5th April 2023
Venue: Hycinth Hotel, Thiruvananthapuram





EV CONSORTIUM CONCLAVE SERIES 2023

As part of the EV Consortium, K-DISC with its consortium partners conducting an EV Conclave series, the first of its kind in the state to promote the adoption of electric vehicles (EVs) and accelerate the transition to sustainable transportation, thereby, supporting Kerala's vision to develop an EV Ecosystem in the state. The series will consist of a series of Conclaves featuring expert speakers and leaders in the EV industry.

A network of industry, R&D, academia and certifying agencies will help in shaping up right technological requirements, widening the technology domain, identifying the gaps and also to ensure that the indigenous technology developments are in line with the market demands. Experts from industry, R&D centers and academia will speak during the conclave highlighting different technological aspects of e-mobility.

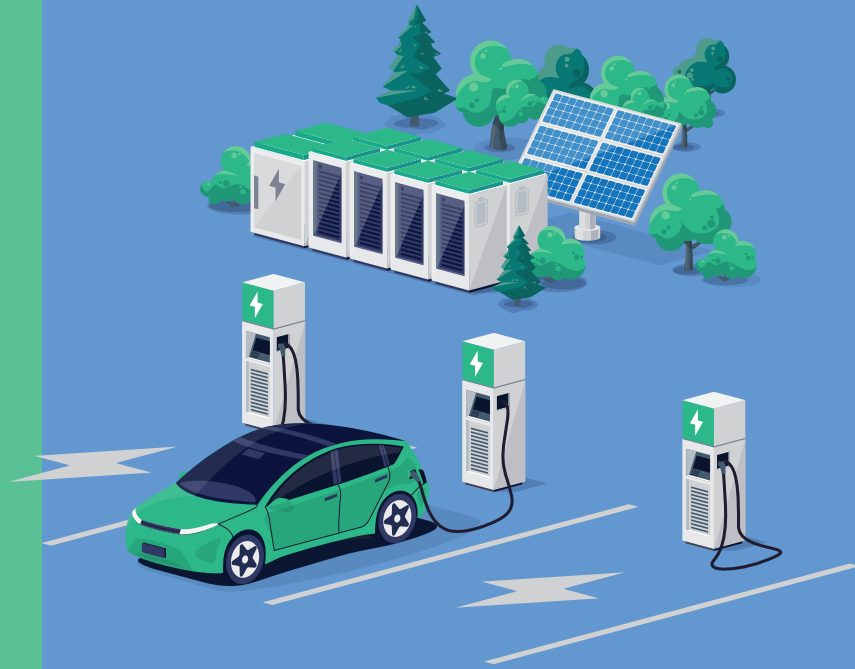
The first one-day Conclave titled "LTO Batteries and its Battery Management System (LTO-BMS)" is scheduled and the discussion will be around the prospects of LTO-based Energy Storage Systems (ESS), design, manufacturing—requirements, safety and challenges.



ABOUT K-DISC

Kerala Development and Innovation Strategic Council (K-DISC) is a strategic think-tank and advisory body constituted by the Government of Kerala aiming to bring out path-breaking strategic plans that reflect new directions in technology, product and process innovations, social shaping of technology and creating a healthy and conducive ecosystem for fostering innovations in the State. The innovation programs of K-DISC, such as One Local Government One Idea (OLOI), One District One Idea (ODOI), Young Innovators Programme (YIP) and Kerala Knowledge Economy Mission (KKEM) initiated by K-DISC, that provides a supportive ecosystem for large segment of society includes panchayats, industrial clusters, young entrepreneurs and students, encouraging them to pursue their innovative ideas and contribute to the state's growth.

K-DISC has been appointed as the nodal agency by Government to spearhead the formulation and implementation of the State's Electric Vehicles Policy. Subsequently, K-DISC formed a consortium of partners from State and Central Government agencies for the development and manufacturing of EV-related components in Kerala. The consortium aims at bringing forth an EV manufacturing ecosystem in the state. The consortium comprises of Travancore Titanium Products Limited (TTPL), Vikram Sarabhai Space Centre (VSSC), Centre for Development of Advanced Computing, Trivandrum (C-DAC), and Trivandrum Engineering Science & Technology (TrEST) Research Park.

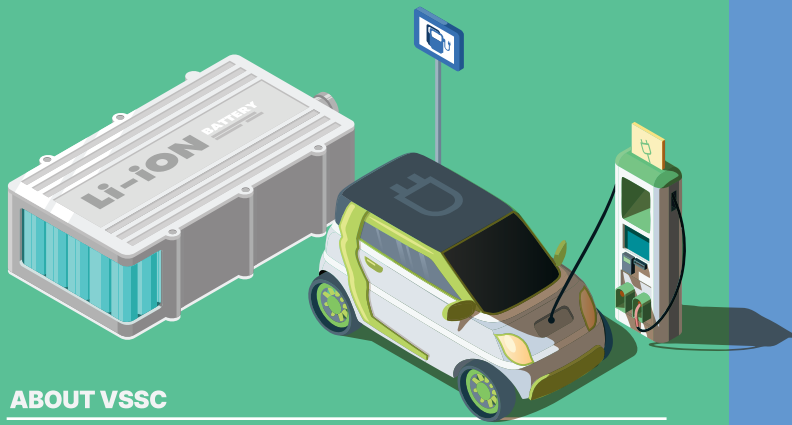


ABOUT TTPL

Travancore Titanium Products Ltd (TTPL) is a Public Sector Unit owned by the State Government of Kerala. It is the largest manufacturer of Anatase grade titanium dioxide in India with ISO 9001:2015 certification. The company follows BIS 411: 2020 standards for its quality products. The company has also expanded its business to include the production of other chemicals such as sulfuric acid and ferrous sulfate.

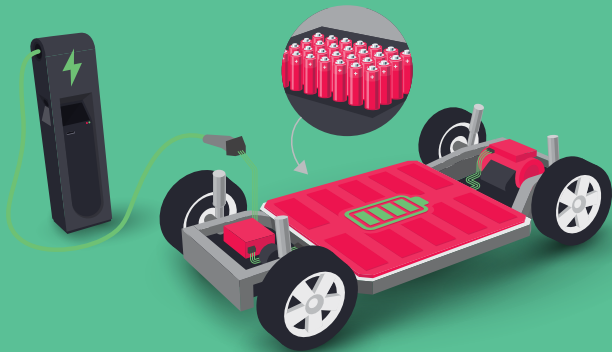
In addition to its business operations, TTPL is committed to sustainable development and has implemented several initiatives to minimize its impact on the environment. These include the use of renewable energy sources, the recycling of waste materials, and the implementation of water conservation measures.

A Battery Material Research Centre (BMRC) is established at TTPL with the funding of K-DISC, where Lithium titanate (LTO), Lithium iron phosphate (LFP), electrode materials and other suitable chemistries are developed for EV application. The electrode materials are then supplied to VSSC for developing batteries suitable for EVs as part of the EV Consortium constituted by K-DISC.



ABOUT VSSC

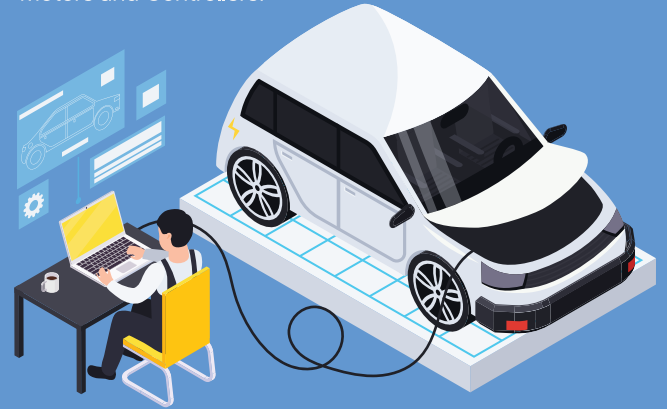
Vikram Sarabhai Space Centre (VSSC), the lead Centre of Indian Space Research Organisation (ISRO), is involved in the design and development of launch vehicles and related technologies for providing reliable access to space. Towards achieving self-reliance in energy sector, VSSC has developed the technologies for different kind of energy storage systems viz., Lithium-ion cells, Supercapacitors, Supercapatteries and Fuel cells. The developed systems are qualified for space applications and are being produced at VSSC for meeting ISRO's requirements. The centre is also focusing on the development of futuristic energy systems with improved energy/power, safety, versatility and cost effectiveness. For EV applications, VSSC is developing lithium titanate (LTO) anode based cells using the indigenously developed material at Travancore Titanium Products (TTPL), Trivandrum.



ABOUT TrEST RESEARCH PARK

Trivandrum Engineering Science and Technology (TrEST) Research Park is an institution owned by Government of Kerala, to promote partnership and interaction between academic community and industry. A Centre of Excellence in Electric Vehicles has been established at TrEST Research Park, which focuses on Drive Train related technologies. Some of the Electric Vehicle Startups in TrEST Research Park focuses on the design and development of EV Motors and Controllers. The students and faculty members of different engineering colleges, including College of Engineering, Trivandrum are involved in the research activities. A RISC V based Electric Vehicle Processor has been designed and developed at TrEST Research Park, and currently efforts are underway to incorporate this in an ekart. Many faculty members, students and Junior Research Fellows are involved in this project. A state-of-the-art Drive Train Facility is being set up by TrEST Research Park at Energy Management Centre, Trivandrum, with the funding from K-DISC. Motors and controllers of 2 wheelers, 3 wheelers and 4 wheelers can be tested in this facility. Dynamometers (30 KW and 150 KW)

and Battery Emulators (36 KW and 160 KW) and power electronics equipment's are being procured. The facility is planned to be set up in Energy Management Centre, Kerala and is the first of its kind in the state. The facility is expected to be operational this year. A Hardware-in-Loop Simulation Lab is also being set up by TrEST Research Park at College of Engineering, Trivandrum. TrEST Research also has the required infrastructure, which includes many software simulation tools like ANSYS, which is suitable for the design of Electric Vehicle Motors and Controllers.



C-DAC

Centre for Development of Advanced Computing, Thiruvananthapuram, C-DAC (T) is an R&D organization under the Ministry of Electronics and Information Technology (MeitY), Govt. of India. The Centre has been working in application oriented research, design and development for various strategic, industrial, consumer electronics and IT systems. In this process, the Centre has acquired competency, expertise and extensive experience in the areas of Power Electronics, Control & Instrumentation, Networking, Broadcast & Communications, ASIC Design and Underwater Electronics. The Power Electronics Group has been working for the past four decades and has expertise and experience in the areas like Wide Band Gap (WBG) device based converters for power electronics applications, e-Mobility subsystem (chargers, drive train controllers, battery management and communication), Power quality solutions, Power electronics interfaces for renewable energy sources, Power conditioner for fuel cell system, Real-time simulators, etc. Scores of technologies developed by the Group have been transferred to industries for large-scale production. The Group works with a mission to evolve itself into a world-class research centre in power electronics while catering to the national objectives.



State EV Consortium - Conclave Series - 2023

CS-01 LTO Batteries and its BMS

Date: 5th April 2023 Venue: HYCINTH Hotel, Thampanoor, Thiruvananthapuram

SCHEDULE OF CONCLAVE

09.00-09.30 am : Registration
09.30-09.40 am : Introduction Session
Welcome : **Dr. P V Unnikrishnan**, Member Secretary, K- DISC
About Conclave : **Shri. Chandrasekar V**, Senior Director, PEG, C-DAC

Session-I

09.45-11.00 am
Topic : **LTO Batteries - Challenges in the material and electrical realization**
Moderator : **Dr. Shaijumon**, Professor, IISER, Thiruvananthapuram
Topic Introduction by TTPL/VSSC
Industry Presentation 1 : **Dr. Bibin John**, Scientist/Engineer-SF, ESDD/VSSC
Academic Presentation : **Dr. Dhamodaran Santhanagopalan**, Professor, ASNSMM
Industry Presentation 2 : **Dr. Srinivasan Anandan**, Senior Scientist, ARCI
Questionnaire & Session Conclusion: Moderator & Presenters
11.00-11.20 am : Networking session
11.20-12.00 pm : Inauguration of Conclave Series-01

Welcome : **Dr. PV Unnikrishnan**, Member Secretary, K-DISC
About EV Consortium : **Dr. KM Abraham**, Executive Vice Chairperson
Keynote Address : **Shri. APM Mohammed Hanish IAS**, Principal Secretary, Industries
Inauguration of Conclave by lighting the lamp
Release of White Paper on BMS-LTO
Unveiling of Lab at TTPL Lab
Presidential Address : **Shri. P. Rajeev**, Hon. Minister for Law, Industries & Coir, Govt. of Kerala
Felicitation : **Dr. S Unnikrishnan Nair**, Director, VSSC
Felicitation : **Shri. Kalai Selvan**, Director, C-DAC
Felicitation : **Shri. George Ninan**, MD, TTPL
Vote of Thanks : **Dr. Koshy P Vaidyan**, CEO, TrEST Research Park

Session-II

12.00-01.15 pm
Topic : **Battery Management System for LTO Batteries - System Architecture and Design**
Moderator : **Dr. Dinesh Gopinath**, Professor, GEC, Barton Hill
Topic Introduction by PEG, C-DAC (T)
Academic Presentation : **Dr. R. Kalpana**, Assistant Professor, NIT, Suratkal
Industry Presentation 1 : **Shri. Libin T T**, Scientist F, C-DAC
Industry Presentation 2 : **Shri. Amal S**, Scientist E, C-DAC
Questionnaire & Session Conclusion: Moderator & Presenters
01.15-02.00 pm : Lunch Break

Session-III

2.00-03.15 pm
Topic : **Prospects of LTO Battery-Challenges in Manufacturing, Packaging, Portection, Safety & Marketing**
Moderator : **Dr. R. Prakash**, Scientist F & Head CAEM, ARCI
Topic Introduction by C-DAC
Academic Presentation : **Dr. Arul Prakash**, Professor, IIT Madras
Industry Presentation : **Shri. Robin George**, Vice President-Battery Advancment, Log9
Questionnaire & Session Conclusion: Moderator & Presenters
03.15-04.00 pm : Networking session
04.00-05.00 pm : Panel Discussions on
Topic : **Requirements of Energy Storage System (ESS) Manufacturing - State and central aiding policies/schemes/systems**
Panelists : Academicians, Policy makers State & Central, Industry, R&D
05.30 pm : Visit to TTPL Lab

