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Progressing the Sustainable Mobility: View of Electric Vehicles

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The outcome document of the United Nations Conference on Sustainable Development in Rio de Janeiro, 2012, affirms the shifting behavior of people's movements. It encourages public transport and railways to minimize movement whenever possible to gain CO_2 emission from the transport sector. Technology trends toward 'eco-mobility' in parallel with government commitments have significantly emerged in a decade after the release of document.

Last July 2022, the European Union announced a target of reducing CO2 emissions by 55% by 2030 compared to 1990 levels. Other countries, such as the United States, India, Brazil, and Japan, are also pursuing similar targets. To meet these goals, car manufacturers are developing new electric vehicle (EV) platforms, including hybrid, fuel cell/hydrogen-based, and purely electric models. Most of the major OEMs have plans to convert 20 to 50% of their capacity to EV by 2025, which will increase to 40%-70% by 2030. Jaguar, for example, plans to sell only electric cars from 2025. For Volvo and Nissan, it is from 2030. General Motors will only produce electric vehicles by 2035. Volkswagen says 70% of its sales will be electric by 2030.

As the global appetite for electric vehicles grows, EVs are the short and mid-term solution to reduce mobility emissions. But, when looking at the carbon footprint of emissions within the whole cradle-to-grave value chain, is the story as clear cut? Many vendors that provide components for vehicles powered by internal combustion engines face significant challenges in matching the pace of change.

EV Sustainable Chain

EVs are radically simpler than fossil fuel-driven vehicles. In mechanical terms, they rely on far fewer traditional components. In fact, an EV drivetrain contains around 20 moving parts, as opposed to the 2,000 parts found in a conventional internal combustion engine vehicle. However, it does not mean the supply chain is much easier, as there's less to move around. EV battery logistics are highly complex and require sophisticated tracking and measurement for safe transport and storage. EV manufacturers also rely as much on software providers, so the supplier mix is very different. Often simpler but not always easier.

History is known that electric vehicles took the road in 1881. Additionally, in 1899,

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90% of New York City's taxi cabs were electric vehicles. In the same year, electric cars outsold all types of cars, including gas and steam-powered vehicles. Due mainly to the cost of production and global adoption of fossil fuels, by 1935, the EV was officially dead. Now, EV innovation is once again moving at an incredible pace, faster than we ever imagined. Moreover, with the cost of production reducing significantly, the likelihood of EVs suffering the same fate as those in the 20th century is highly unlikely.

Auto-mobility supply chains are truly global supply chains with global sourcing patterns. They also tend to be lean and agile. So "just in time" is important for auto-mobility. These days, the challenges that the industry is facing with semiconductor shortages, with some materials also shortages.

Several major logistic companies have pledged that by 2040 or 2050, and their supply chain must be carbon neutral. Ultimately, everybody needs to go in that direction if they want to stay in the green and sustainable market. In order to have a significant impact on CO2 in the supply chain, they invested in an electronic vehicle (EV) fleet. The supply chain is far more complex, and the next step we need to take is to have green assets, like warehouses and offices, that all contribute to those emissions. In addition to that, it is necessary to work on supply chain optimization.

It is believed that technology plays an important role when it comes to decarbonizing across roads, air, and ocean. A localized and shorter supply chain is optimized to have every kilometer less driven or flown. Reading through customer data and trying to optimize processes, mode of transportation, and the way the process is transporting to all the world.

The Adjacent Technologies of EV

The biggest challenge facing EVs today is their maximum range and charging rate. However, the Stellantis consortium has set performance targets that claim to have cars that can travel up to 800 kilometers on a single charge. In parallel, the charging speed is targeted to reach 32 kilometers per minute. Note that Stellantis consists of Fiat Chrysler Automobile and Peugeot SA, with a total of 14 car brands by today. The consortium, in particular, works on two big programs. The first one is the “vehicle to grid”. Vehicles are connected to the grid in bi-directional power. The cars can ask for power to the grid or also give power to the grid when needed. The next exciting innovation is charging on the move. A collaboration with universities intended to test the so-called dynamic wireless power transfer. The technology allows vehicles to be recharged while driving. Cars that are moving on the street can be recharged because of the coils that are placed below the asphalt.

Eventually, the surge of EVs must compensate with charging infrastructure. Now, there's a lot of talk about the democratization of charging for residential and business properties. The BP and Aral offer charging and fueling vehicles under the same canopy. Since they predicted over the next few years, there will be a mix of different engine types, and both fuel and electricity will be needed. Today’s chargers are able to dispense 300 kilowatts. Recharge 300 kilometers of range in about 10 minutes. However, most charging stations take time to build since they include building permits. Ultra-fast charging with a few hundred kilometers range within a few minutes is the future and helps to democratize charging.

The energy sector is very close with the auto-mobility team to make sure that these two industries talk together. Nobody would've ever thought that today, a plane in the air that's driven by electric power exists. This trend is continuing. The challenge of electrification, which is also an opportunity, is the battery. The lithium battery. It is considered as being dangerous goods. Right solutions in terms of addressing the regulations related to these batteries for transportation and warehousing are essential.

Innovation for Sustainability

This edition focuses on promoting innovation in multiple aspects, including renewable energy, new materials, and higher efficiency of industrial processes. Additionally, several papers discuss innovative agendas related to cleaner waste processing and the circular economy.

First paper is written by L. Driouach, B. Zitouni, and Z. Khalid. The paper reported the implementation of lean manufacturing for micro-enterprise in Morocco. The authors validated that the implementation of lean manufacturing has a positive impact on micro industries such as contractors, consultants and also government agencies with employees under 20 personnel.

Second paper is written by C. Sitinjak, R. Ismail, R. Fajar, E. Bantu, L. Shalahuddin, S. Yubaidah, W. F. Simanullang, and V. Simic. The paper investigates the policy of dismantling management for cars in Indonesia. The authors uncover that, due to high awareness of reducing carbon footprints, the scenario of dismantling cars in Indonesia is unlikely to happen in the near future.

Third paper is written by A.Q. Ibrahim and R.S. Alturaihi. This paper explains the search for higher efficiency in industrial heat exchangers for multi-phase fluid. Authors argue that their redesigned winglets are able to increase the heat convection.

Fourth paper is written by M.H.N. Thi, N.L. Thai, T.M. Bui, and N.T.P. Thao. The paper explores alternative solid-state illumination as the main part of WLED (white light emitting diode) devices for television and mobile phone displays. Authors confidently claimed that using the solid-state technique under significant temperature, the luminescence was found to be optimized in term color deviation, rendering, and quality scales.

Fifth paper is written by K. Sehairi and F. Chouireb. The paper examines the usage of new machine learning and deep learning models in video surveillance systems. The authors formulated the arrangement of a minicomputer to achieve computational load applications such as video surveillance, tracking, virtual reality, and augmented reality.

Sixth paper is written by K.Y. Ravelo-Mendivelso, M.T. Villate-Fonseca, J.D. Hernández-Vásquez, O.M. Miranda-Samper, P.J. Pacheco-Torres and M.J. Campuzano. The paper the optimization in oil, natural gas, and alternative energy industry. Authors argue that they improve the thermal efficiency of a shell and tube heat exchanger in real operating conditions.

Seventh paper is written by S. Nukeshev, K. Yeskhozhin, Y. Akhmetov, D. Kossatbekova, K. Tleumbetov, and K. Tanbayev. The paper presents improvements in agriculture machines that avoid the depletion of the land. Authors argue that they were able to formulate the traction force of the sod seeder on the cultivated soil layer based on experimental studies.

Eighth paper is written by Y.N. Nugroho, R. Harwahyu, R.F. Sari, N. Nikaein, and R.-G. Cheng. The paper examines the operators to monitor the anomaly in the telecommunications network immediately. The authors claimed that the developed system was able to detect the anomaly with an accuracy of more than 90%.

Ninth paper is written by Sunarsih, E. Jadmiko, M.B. Zaman, A.M.A. Malik, and A. Ali. The paper study investigates the characteristics of ship maneuvering performance and behavior in maritime transportation. Authors argue that their study resulted in the analysis of the implication and inadequacy of the current circumstance toward appropriateness, accuracy, and validity of the research and related studies in this field.

Tenth paper is written by S. Kartohardjono, E.F. Karamah, G.N. Talenta, T.A. Ghazali, and W.J. Lau. The paper explores the cleaning process of combusted gas that harm human and

the environment. Authors claim that their polysulfone hollow fiber membrane module has NOx and SO2 reduction efficiencies at around 93.9 and 99.8%, respectively.

The next paper is written by D.G. Cendrawati, N.W. Hesty, B. Pranoto, Aminuddin, A.H. Kuncoro, and A. Fudholi. The paper explains the validation of the Weather Research and Forecasting (WRF) database applied in wind power generation. Authors argue that they were able to quantify Indonesia's wind flow and wind energy generation.

Twelfth paper is written by T. Trisnadewi, E. Kusrini, D.M. Nurjaya, B. Paul, M. Thierry, and N. Putra. The paper explicates the current development of energy storage material in the field of sustainable building. Authors formulated a composite of phase change materials (PCM) with the addition of nanoparticles that increased its stability and thermal conductivity significantly.

Thirteenth paper is written by Zulkarnain, Machfud, Marimin, E. Darmawati, and Sugiarto. The paper explains the application of Quality Function Deployment (QFD) in coffee packaging for a micro-enterprise. The authors argue that they can produce tone and manner for specialty coffee packaging labels for specific customers.

Fourteenth paper is written by Y. Wicaksono, A.S. Nugraha, E.D. Irawan, N. Nada and S.D. Nurhansyah. The paper formulates an alternative method in drug development to increase its bioavailability. Authors claim that the solubility of this new method showed a significant improvement of about 2.7-fold compared to the initial condition.

Fifteenth paper is written by M.A.F. Kurnianto, R. Irwansyah, L. Fabianto, A. Armadani and Warjito. The paper underpins the urgency of clean water technology using a series of desalination methods. The authors propose a model and effectively validate the new alternative desalination methods using droplet atomization.

Sixteenth paper is written by E. Widodo, F.S.U. Putra, D. Hartanto, N.I. Arvitrida, A.Y. Bagastyo, IDAA Warmadewanthi, and T. Soehartanto. The paper examines the desalination process utilized in wastewater treatment. The authors built a numerical model that showed a scenario with the best return in financial terms.

Seventeenth paper is written by T.R. Hidayani, B. Wirjosentono, D.Y. Nasution and Tamrin. The paper examines the circular economy of pulp waste and fly ash as composite filler material. Authors claim that these two substances can be used as sound-absorbing composites with comparable value.

Eighteenth paper is written by V. Suryanti, T. Kusumaningsih, D. Safriyani, and I.S. Cahyani. The paper presents the search for natural resources as food additives rather than the synthetic substance that already exist in the market. The authors revealed the potential of screw pine leaves to obtain food-grade cellulose to meet food additive criteria.

Nineteenth paper is written by A.R. Noviyanti, Y.T. Malik, U. Pratomo and D.G. Syarif. The paper explains the novel material for solid oxide fuel cells as an alternative electric generator. The authors argue that the lanthanum-based perovskite cathode is able to reduce the cost of preparation due to its lower activation energy.

Lastly, the final paper is written by A. Noorsaman, D. Amrializzia, H. Zulfikri, R. Revitasari, and A. Isambert. The paper explores the application of machine learning in optimizing gas pipeline logistics. Authors claim that this study accurately predicts the failure and reliability of pipeline networks in the United States.

In conclusion, the innovation from the campus laboratories assimilates with industrial and operational business, enabling transformations in how we live and work. Ijtech greatly welcomes and looks forward to receiving your submissions and sharing your research with our readers.

With warmest regards from Jakarta,

Dr. Yudan Whulanza
Editor in Chief