CIHT Dubai Online Seminar – Bulletin

SPEAKER:
Salman Hussain

About the Event

Transport's path to a net-zero future doesn't just hinge on shiny new electric vehicles—existing fleet conversions can also play a pivotal role. FUSE EV converts internal combustion engine vehicles to electric vehicles. This CIHT seminar covers the electrifying of current fleets, showing how to transform diesel-hungry workhorses into zero-emission champions without having to start from scratch.

This session also discusses how fleet electrification can help organizations meet ambitious sustainability targets, all while delivering operational efficiencies and long-term cost savings. Real-world examples and accessible insights to replace complexity and jargon, ensuring participants gain a clear understanding of the practical steps, technologies, and strategies for converting conventional fleets into clean, quiet EVs.

About the Speaker

Salman Hussain, Co-Founder of FUSE EV Conversions, is a passionate innovator and respected figure in sustainable transport solutions. With a career focused on bridging advanced EV conversion technologies and the practical demands of fleet operators, Salman has a proven track record in guiding organizations through the electrification process. His expertise isn't confined to spreadsheets or engineering labs; he's worked hands-on with diverse clients—public agencies, logistics companies, and corporate fleets—to help them achieve their climate targets and improve their bottom lines

Event Summary

Salman shared his 27 years of experience in the UAE, including eight years in the electric vehicle (EV) sector. As one of the first private EV buyers in the UAE, owning one of the first Renault Zoes in the Middle East, he has observed the country's progress toward electrification.

He introduced FUSE, an engineering company specializing in EV powertrain solutions for retrofitting various vehicles, including trucks, cars, and military vehicles. One notable project involved collaborating with an NGO to convert the Toyota Hilux into an affordable EV solution for low-income countries. FUSE also retrofits classic cars, extending their lifespan through electrification.

Electrification is an inevitable transition in transport, with retrofitting playing a crucial role in accelerating this shift. Transport accounts for 25% of global CO2 emissions, making it the second-largest source after power generation. While private vehicle electrification has progressed significantly, commercial vehicle adoption lags, posing a challenge as these vehicles typically have higher emissions per kilometre. Technologies like biofuels and hybrid vehicles have helped reduce emissions, but substantial electrification is needed to meet net-zero targets by 2050.

A major barrier to EV adoption is cost, with new EVs being 30-50% more expensive than diesel vehicles. While premium pricing may be justified in the private sector, commercial fleets focus on return on investment. Retrofitting offers a cost-effective alternative, being 40-60% cheaper than purchasing new EVs while extending the lifespan of existing vehicles. Additionally, retrofitting reduces carbon emissions by 20-30% since major vehicle components remain in use. Replacing an

internal combustion engine with an electric powertrain eliminates tailpipe emissions, making retrofitting a competitive pathway to achieving carbon neutrality by 2050.

Lower electricity costs and reduced EV maintenance mean retrofitting can pay for itself in about five years. The total lifetime carbon footprint of a retrofitted EV is also significantly lower than both petrol/diesel vehicles and newly manufactured EVs.

Cost estimates for retrofits vary: a light-duty truck retrofit costs $8,000-$20,000, while a heavy-duty truck costs $100,000-$300,000—less than half the price of new EVs. FUSE's Toyota Hilux retrofit offers a 200 km range with 120 hp, matching the original engine's performance, at a cost of $15,000-$20,000.

Most commercial vehicles have a ladder chassis, facilitating modular retrofits with minimal modifications. The existing chassis and axle remain, with the new motor and batteries distributed across the vehicle to maintain weight balance. Retrofit designers can tailor configurations to optimise battery chemistry and size based on usage needs, reducing costs and enhancing return on investment. Innovations like swappable battery packs further enhance viability, cutting refuelling time to as little as two minutes.

The retrofitting process includes an initial assessment and design, removal of obsolete combustion engine components, integration of the new electric powertrain, electrical system setup, and rigorous testing before certification.

Global examples of retrofitting include Wrightbus in the UK, which converts ~10-year-old buses into EVs for £200,000, compared to £500,000 for a new bus. In Germany, UPS is testing 25 retrofitted delivery vans, while the e-dumper truck in mining operations generates electricity while descending, eliminating charging needs and even supplying excess energy to the grid.

Classic car electrification is also gaining traction, addressing maintenance difficulties and part shortages. Converting classic cars into EVs enables modern features and daily usability while preserving the original chassis.

FUSE's retrofits have contributed to humanitarian efforts, with solar-powered EVs supporting remote villages where fuel deliveries are challenging.

Governments are increasingly recognizing retrofitting as a key strategy, with new legislation in the US, UK, France, and India. France's regulatory framework is particularly robust, mandating certified components, safety standards, and periodic reviews, fostering industry growth.

However, challenges remain:

- Retrofitting is technically complex, with few specialized providers.
- Charging infrastructure and grid upgrades are still lacking.
- Upfront costs and uncertain residual values make investment decisions difficult.
- Many regions, such as the Middle East, lack regulatory frameworks for retrofitting.

Future solutions include:

- Onsite solar charging to reduce grid dependence.
- Financing and leasing models to cover retrofit costs.
- Industry collaboration to standardize retrofit processes and train mechanics.

With battery costs declining, electrification will accelerate. Standardisation efforts, streamlined retrofitting processes, and circular economy initiatives will further drive adoption, reducing raw material extraction and promoting sustainability.

Questions

Safety is a key consideration, especially given changes in the weight profile of the vehicle as it goes through a retrofit. How do you ensure that the vehicle remains safe when it is converted?

There are a lot of regulations which have to be followed. Safety is very important, and there are a lot of standards that need to be considered. For example electromagnetism testing is required. In addition crash simulation is required, this can be done on a crash course, or by computer simulation. Given the location of collisions on electric vehicles battery replacement is critical for safety. For most retrofits the battery is split between the front and the back. The placement of batteries in a retrofit vehicle is normally very similar to their placement in a new build electric vehicle. There is a separation between high-voltage loop and any controls within the vehicle via a secondary low-voltage loop.

As the battery placement for a retrofit electric vehicle is split between the front and the back, and an internal combustion engine vehicle would be mostly at the front, how are you able to balance the weight distribution to ensure that the retrofit vehicle handles in a similar way?

For the internal combustion engine vehicles, both the engine at the front and the fuel tank at the back are removed. Normally the fuel tank is at one side of the vehicle, and is counterbalanced by the weight of the passengers, although this is not possible for heavier trucks. The split of the battery pack between the front and the back of the vehicle normally balances the weight of the removed engine and fuel tank. Most retrofit companies try to maintain this balance as much as possible. The regulators do allow a change in weight of 10 to 20% this could be lighter or heavier. In many cases the retrofit vehicle is lighter in weight than the internal combustion engine vehicle. If the weight changes by more than 20%, then the structure of the vehicle may not handle this well.

How do you feel the Middle East is progressing towards meeting global electrification future targets, particularly in the light of the recent COP here in the UAE

the UAE is a shining example within the region of electrification of vehicles. This is partly driven by an increase in Chinese electric vehicle imports. The Chinese electric vehicles are significantly cheaper than other options, and this is allowing more people to adopt these vehicles. The UAE however, is an outlier within the broader Middle East. There is much more work to be done within the region. The market is very much petrol centric.

Is retrofitting only carried out on trucks and vans or can it be carried out on regular cars, and if not will it be shifted to regular cars, particularly more modern cars?

There are companies that are working on modern passenger vehicles. It is more difficult than the commercial or classic segment. The main challenge is that the modern cars are relatively cheap which makes it difficult for a retrofit vehicle to compete in price with a new Chinese electric vehicle. Many people would prefer to have a new vehicle even if they are paying a slight price premium. There are also particular issues in relation to insurance and the registration of retrofit vehicles.

Do you change the whole dashboard as many indicators would no longer be necessary for example the petrol gauge.

Yes the dashboard is changed. There are two methods that most people use. The first one is to swap out the old features for a LCD screen. This is common because it allows greater software integration to come in. A less common approach which is used in classic cars is to display the important details using an old analogue format in keeping with the styling of the classic car.

How easy is it to drive a retrofit vehicle across an international border, in addition how easy is it to get insurance for a retrofit vehicle?

As long as the region accepts it then this should be less of an issue. The insurance normally depends on the country in which you purchase the insurance, so if retrofit vehicles are accepted within that country, then there should be no problems. The main challenge is identifying an insurance company that would insure a retrofit vehicle. If a company will provide insurance, then it would be provided across borders.

Is retrofitting to hybrid options like fuel and electric considered?

There are people working on hybrid solutions, but these only really work on medium duty or heavy duty trucks. The cost of offering a retrofit solution is high, so this limits this to the more expensive vehicles. For smaller vehicles they would likely only be viable with subsidy. Hybrid is not an easy retrofit solution as it requires modifications to the control system. But there are definitely some people working on this.

Is retrofitting happening on motorcycles considering their prevalence in the developing world?

As with most small vehicles mass adoption would be required for retrofit to be cost-effective. You have to offset the cost of installation, maintenance and certification against the cost of buying a brand-new electric motorcycle. With smaller cheaper vehicles the cost difference is relatively low and so people pay the small premium to buy

brand-new.

In the Middle East we have significant heat during the summer, how does the air-conditioning drain on the battery affect the cars range. Is extra insulation required?

Batteries do need to be thermally regulated, the chilling which is happening within the AC also keeps the battery at a reasonable temperature. The same thing is required in cold temperatures where the battery needs to be heated up so that it is efficient.

How is business going, it seems like a niche market, but from the examples that you shown it looks like it is growing. Is it possible to make a profit at this stage with this product.

There is still some research and development as standard solutions are being created. But given the growth in this field it is expected that retrofit company will be very profitable in the future.

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