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PRESS RELEASE

The new generation batteries – Solaris High Energy+ ADAS systems in Solaris buses.

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- **Solaris launching new generation Solaris High Energy+ batteries at Busworld 2019**
- **At least 200 km on a single charge, regardless of the weather conditions**
- **New ADAS (Advanced Driver Assistance Systems) solutions in Solaris vehicles increasing comfort and safety**

Solaris batteries range for electric buses on offer

Back in 2011, when Solaris unveiled its first electric bus, its offer included only one battery option. Over the next years the company has remarkably extended its technical competence in this area. Over 20 million kilometres covered by the Urbino electric buses and experience gathered from the operation of vehicles in dozens of cities in various climates make it possible for Solaris today to offer the optimal battery solutions to its customers. Today, Solaris offers the following batteries to its electric buses: Solaris High Power, Solaris High Energy and Solaris High Energy+.

Solaris High Power

Solaris High Power batteries are characterised by a high “power density”. In practice, this means that the batteries can be recharged with high current, and consequently we can recharge them very quickly. These batteries come in packs with a nominal capacity of 29 kWh each. We can install up to 7 packs in one bus, which sums up to a maximum total capacity of over 200 kWh. Crucially, the batteries have a long life and a significant number of charging cycles. The firm is able to ensure an unlimited number of cycles over a period of 7 years.

Generally, the Solaris High Power battery can be charged using electricity equivalent to four times the capacity (4C). Thus, assuming that the bus features a battery of that type with a capacity of 116 kWh, then the maximum charging power for that battery will be 450 kW. Of course, engineers prefer to express the same parameter in ampere, because we do not use the same power throughout the whole battery charging process. So in fact we ought to say that the maximum current battery charging amperage amounts to 800 A. So far, Solaris has provided fast-charging pantograph stations for batteries of the High Power type with varying charging powers, reaching up to 560 kW!

The Solaris High Power batteries are used in circumstances when the frequent discharge and also recharge of batteries, usually using pantograph chargers, is assumed. Of course, power can be replenished also using plug-in charging stations. This is a perfect solution for those transport systems where fast pantograph charging stations, deployed along the vehicle route or at line terminals, are used to recharge electric buses. This type of battery has been installed by Solaris in electric buses operating

in Brussels, Warsaw or Barcelona, for instance. It is worth noting that High Power batteries are also applied in the Trollino trolleybuses.

Solaris High Energy

The second type of batteries on offer are the Solaris High Energy. These have a relatively high capacity and are usually used in circumstances where a smaller number of “refills” during the day is assumed. The maximum charging power of that battery in kW corresponds to its energy capacity expressed in kWh. The nominal capacity of packs in that battery totals 50 kWh. The maximum, standard number of Solaris High Energy packs amounts to six for a 12-metre bus and to seven for an 18-metre vehicle. When applying this type of battery, we have the possibility to reach a nominal capacity of 350 kWh.

This is a solid solution for those operators who prefer a smaller number of recharging sessions throughout the day. Most often though, the energy in this type of battery is replenished at night, using chargers located at bus depots, i.e. when the buses are not running.

New development – Solaris High Energy+

The firm’s latest development are the Solaris High Energy+ batteries. These were designed by the Solaris Research and Development Department, bearing in mind the needs of carriers who want to cover at least 200 km on a single charge, regardless of the weather conditions, and thus regardless of air-conditioning or heating working.

The Solaris High Energy+ batteries are characterised by an extremely high energy density. Thanks to this feature, we manage to fit 79 kWh into one pack! This means that in the case of 7 packs – that is how many can be installed in an articulated bus at the most – we reach a nominal energy rate of 553 kWh! And 5 packs of that battery will fit into a 12-metre bus. This battery type can be recharged using a power equalling its capacity.

It may be worth underscoring that the solution is the result of cooperation between the Solaris and BZM Poland Research and Development Departments. Batteries of this type can be used only in Solaris vehicles and as of today, no other producer in the electric bus market is offering them.

The contractor executing the design initiated by Solaris is BMZ Poland, a leading European manufacturer of intelligent power supply and energy storage systems based on lithium-ion technology.

All of the above batteries, which are offered with electric buses of Solaris, boast a nominal voltage ranging between 600 and 700 V. The energy storage tanks used in the Urbino electric are capable of working in temperatures between -15 and +50 degrees Celsius. In order to optimise their efficiency, and to extend their service life, they are warmed up or cooled down. The battery cooling system is based on liquid-cooling.

New ADAS Solutions (Advanced Driver Assistance Systems) available in Solaris vehicles

Active driver assistance systems help drivers by performing certain actions before them or in their stead, and thus provide them with invaluable seconds for a proper response.

Solaris has presented at Busworld 2019 a vehicle with a new Collision Mitigation System (CMS) which initiates automatic braking. When a radar installed on top of the bus detects the risk of a potential head-on collision, the system goes into braking mode, reducing velocity and thus alleviating the consequences of a potential collision. The solution is already used in coaches and has now been applied in city buses. The correct calibration and configuration is of great significance in city buses where - contrary to coaches - there are no safety belts and most passengers ride standing rather than seated. Therefore the braking force is crucial for the passenger safety – and it is an additional challenge the manufacturers are facing.

Moreover, Solaris has presented new solution reducing “blind spot” effect for drivers. Cameras placed outside the vehicle detect pedestrians and cyclists who are not reflected in mirrors, especially during turns, even if it may seem to them that they must be visible to the driver. In order to solve this challenge, Solaris has availed itself of the Mobileye Shield+, a system warning the driver – with acoustic signals and visual alerts on the display – also in cases when changing lanes without adequate signalling beforehand or when no appropriate distance to the vehicle in front is maintained. The system also alerts the driver to collision risks. The device detects every pedestrian and cyclist within 80 cm from the bus, alerting the driver to their presence – again, acoustically and visually on a display. What the driver does not see in the mirror is pointed out to them by the camera steering device. Thus there is only one thing disappearing now, and that is doubts about the visibility on the road.

An enhanced visibility is also ensured by the completely re-designed mirrors, or rather cameras which project the image onto screens inside the vehicle. The ingenious design of the MirrorEye installed in lieu of regular rear-view mirrors corresponds to class 2 and 4 visibility (optionally class 5 in the right “mirror”) and this yields a whole range of advantages. Above all, there is no more need to reset and regulate mirrors after a driver switch – the screens and cameras always display the optimal scope regardless of the driver’s height. The width of the vehicle is reduced – which is of great importance on narrower and tight urban streets, and which also considerably reduces the risk of collision or of snagging the mirror on infrastructure items. What is more, the cameras substantially widen the field of view and they improve the aerodynamics of the vehicle.

The lack of mirrors enhances the safety of passengers, pedestrians and those waiting at the bus stop. The device employed up until now protruded from the bus contours, which involved the risk of hitting a person standing too close to a bus passing or turning into a bus pullout. The warmed cameras do not freeze nor fog up and, owing to their reduced size, are easier to clean or wash during the daily cleanup of a bus. What is more, the screens can also show distance thresholds of the various bus parts, such as its rear, particular doors or the axle. A horizontal line displayed on the screen eases manoeuvres and parking, and above all renders these procedures safer.

About Solaris Bus & Coach S.A.

Solaris Bus & Coach S.A. is one of the leading European bus and trolleybus manufacturers. Benefiting from over 20 years of experience and having manufactured over 17,000 vehicles, Solaris affects the quality of city transport in hundreds of cities across Europe every day. Thinking of the future, the firm is setting new standards by dynamically developing its products, in particular in the electromobility sector. Solaris products have been repeatedly awarded for quality and innovation in Poland, as well as in other countries. The Solaris Urbino 12 electric won the prestigious European "Bus of the Year 2017" competition. In September 2019 Solaris Bus & Coach S.A. joined CAF Group, which acquired 100% of the shares of the company.

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