ul. Obornicka 46 , Bolechowo-Osiedle 62-005 Owińska
Tel.: +48 61 66 72 333 Fax: +48 61 66 72 310
office@solarisbus.com, www.solarisbus.com

PRESS RELEASE

Direction: no emissions. Solaris at the InnoTrans 2018

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• Solaris Urbino 12 electric and Trollino 12 at the InnoTrans 2018 (outdoors stand in the Sommergarten Bus Display) • Over 1200 trolleybuses delivered to 16 countries • Over 330 electric buses delivered and ordered • Experience derived from driving over 8 million electric kilometres • Nearly 2000 feasibility studies carried out for launch of electric buses. • Comprehensive offer regarding e-mobility: bus, charging system, prepping installation

(Berlin, 18th November 2018) The press conference during InnoTrans trade fair in Berlin was a stage to the premiere of the new Trollino 12 trolleybus and the electric Urbino 12 with the latest solutions in e-mobility. Both vehicles are exhibited in the Sommergarten Bus Display, while Solaris invites you to its stand at the CityCube (Hall A, stand number 304).

In barely seven years since the première of its first electric bus, Solaris has supplied to or secured orders for over 330 such vehicles from customers in fourteen countries. At the InnoTrans 2018 trade fair the Polish producer is showing zero-emission vehicles that draw from the experience of over 8 million kilometres. The latest technological solutions regarding heating, cooling and the steering system focus on reducing energy consumption. Solaris offers comprehensive investment management services that cover not only the supply of buses and charging systems, but also ensures the preparation of installations including construction work.

New solutions

Since introducing electric drivelines to its offer, Solaris has been constantly working on technologies to ensure an even better performance. Most of the effort devoted to the development of a heating system in electric buses is rooted in the desire to reduce energy use and to ensure the range extension of the vehicle. In order to achieve this, producers often go for a diesel-fuelled heater rather than other solutions; this one, though effective when temperatures are very low, is far from emission-free. Solaris has proposed an innovative solution in the form of a hybrid heating system fuelled with LPG. This solution guarantees low emission and is much cheaper than the use of a standard diesel heater. What is more, LPG tanks are smaller than those for the previously applied CNG, which means their installation is less complicated.

Another option available to customers is a heating and air-conditioning system where CO_2 is used as the working fluid, which is currently considered the most environment-friendly solution. The use of a heat pump allows to procure heat from auxiliary devices and thus limit the consumption of energy derived from batteries, which, in turn, results in extending the vehicle driving range and ensures efficient operation at low temperatures. All of these operations occur in zero-emission mode.

Another change the engineers of Solaris are already bracing for is the gradual limitation of the use of refrigerant R134a used in current air-conditioning systems. Pursuant to EU decisions, by 2030 this substance is to be completely replaced by the much more environment-friendly R513a. Thanks to the efforts of the Polish producer and one of its suppliers, the air conditioning of vehicles from Bolechowo can already be supplemented with the cleaner agent.

Changes have also been applied to the power steering system. For quite some time, this novel solution

has been a staple in all electric and hybrid buses rolling out from the Bolechowo factory and an option for trolleybuses. Of course, we speak of the electric power steering pump, powered with standard 24V batteries. This solution results in the reduction of energy use – since the pump does not burden the main engine – and, hence, it also increases the vehicle range. Another argument in favour of this design is the variable rotational pump speed thanks to which the force of the power steering is greater for lower speed levels and it drops along with the rising speed. First and foremost, however, this solution entails a significant improvement of security, since the electric power steering pump is not dependent on other devices the malfunctioning of which could lead to loss of control over the vehicle in extreme cases.

Remote diagnostics

Another novelty is the remote diagnostic system for electric buses called eSConnect. It enhances and supports diagnostic and maintenance possibilities and also facilitates the analysis of specialist data derived from a vehicle. Buses equipped with a remote diagnostic system will allow the producer to establish a database of real performance data that can be later used to further perfect solutions applied by the manufacturer.

Created for the purpose of supporting maintenance, the eSConnect system may be installed both in every newly produced electric bus, as well as in those already delivered to customers. In fact, some of them have already decided to apply the pilot scheme to their bus fleets. What is of importance to vehicle users, they can also use the data allowing them to optimise their bus fleet operation. Apart from serving maintenance purposes, the remote diagnostic system will also enable the manufacturer - a European leader in the production of electric vehicles - to further refine its vehicle designs which have already garnered the firm the title of city bus of the year 2017.

Remotely collected data include among others information on the bus fleet position time- and location-wise, the updated battery status, the mileage covered by any given bus in a time frame defined by the user or the energy use. The eSConnect system allows also for the remote identification of potential defects signalled by the vehicle on the driver's panel, the monitoring of operating parameters of the system and the generation of statistics, for instance the number of charging cycles and the mean time needed to recharge batteries.

The remote diagnostic system proposed by Solaris entails quite a few advantages for its customers. For the buyers of vehicles from Bolechowo the system means a better use of the vehicle fleet and ensuring the correct operation of buses by drivers. What is more, it gives clients the possibility to collect and analyse data that simplify a precise identification of technical requirement for buses serving on particular routes.

Prepare for electromobility

To most municipalities and transport operators, electric drives represent a novel solution. At the request of the interested party, and in order to help them prepare for the electrification of bus lines, Solaris can draft an individual feasibility study. The Office of Research and Development of the Polish manufacturer will devise the optimal solution in terms of e-mobility, based on customer requirements and a range of input data, such as: the temperature range in a given city, needed to estimate energy consumption not only in normal conditions but also in extreme situations, average speed, the topography of the area the bus line will serve, the number of stops, the passenger streams, the timetables and many other.

The outcome of the feasibility study will be a report listing recommendations of the best technical solutions with regard to electric buses. The study takes into consideration such factors as the place of operation of the electric bus and the carrier's requirements. In practice, this means the document will name among others the size and type of batteries, the recommended charging infrastructure, predicted energy use and the battery service life. By sharing best practices and its know-how Solaris supports municipal transport operators in their efforts to develop electromobility.

The Solaris Urbino 12 electric on display

The drive unit of the Solaris Urbino 12 electric presented at the InnoTrans fair is an electric drive axle with two 125 kW integrated electric engines. The energy needed to propel those is stored in Solaris High Energy batteries with a total capacity of 240 kWh. The vehicle is recharged by means of a 40 kW charger. It is one of five electric buses ordered by the operator from Frankfurt/Main.

Apart from many technological novelties applied to the drive construction of the buses for Frankfurt,

the Bolechowo-based manufacturer has also used numerous solutions aimed at improving the comfort and safety of passengers on board the vehicle. The Solaris Urbino 12 electric vehicles are being fitted among others with an efficient air conditioning system regulating the temperature of the whole vehicle, as well as energy-saving LED lighting of the interior and a comprehensive passenger information system comprising 3 LCD screens. The producer has also installed USB ports which will enable passengers to recharge their mobile devices mid-ride. Interestingly, these ports are located at each row of seats. The vehicles for In Der City Bus GmbH from Frankfurt also provide access to wireless Internet using Wi-Fi technology.

The electric bus of Solaris to be used in Frankfurt will be able to carry up to 70 passengers at a time, 28 of whom travel seated. Two additional folding seats have been installed in the space reserved for wheelchair-bound disabled persons and prams or pushchairs.

The Solaris Urbino 12 electric buses commissioned by the Frankfurt-based operator are a model awarded the title city bus of the year in the “Bus of the Year 2017” contest.

Solaris has delivered nearly 200 buses with an electric drive so far. Another 130 are being assembled. The electric Urbino have covered a distance of over 8 million kilometres for customers from 14 countries. Take a peek at the most popular electric bus model in Europe, on outdoor display in the Sommergarten Bus Display.

Solaris trolleybuses

Solaris has been offering its customers low-noise and environment-friendly trolleybuses for nearly twenty years. In this time the Polish producer has turned into one of the biggest suppliers in the EU. The InnoTrans 2018 trade fair will see the début of the Solaris Trollino 12 in a new design. Solaris presented its first trolleybus in 2001. Since then it has delivered over 1200 vehicles of this type to customers in sixteen countries. Solaris trolleybuses can be encountered in nearly 50 cities all across Europe, for instance in Bologna, Budapest, Esslingen, Gdynia, Ostrava, Pilzno, Riga, Rome, Salzburg, Sofia, Tallinn, Tychy or Vilnius.

New solutions

All solutions that make up the force and innovation of the new Solaris have been combined with the established and popular construction of the Trollino trolleybus. Therefore, just like other vehicles of the Urbino family, they contain:

- a lighter and more rigid, but equally durable body frame, made of material extremely resistant to corrosion;

- a reduced vehicle weight as a result of the shaping and location of steel components;

- joints reinforcing the area where vertical profiles of the body frame come into contact with the horizontal ones and which braces the metal floor plate structure. Owing to this new solution, the trolleybus floor is not only more durable but also better protected against weathering.

The “skin on skin” technology of vehicle construction allows to increase the effectiveness of production processes and to ensure an improved aesthetic finish. This makes the trolleybus easier to maintain and service. The side panels are bolted to each other, which facilitates assembly and exchange in the case of damage to part of the chassis. Simplified access to particular components of the vehicle has been ensured thanks to the use of a rear and side inspection flaps, which can be tilted open at an angle of 170 degrees, not 130 degrees as it was the case before.

At the moment Solaris’s product range encompasses three models of the Trollino family. These are the 12-metre Trollino, the 18-metre articulated Trollino and the 24-metre bi-articulated Trollino 24. All are based on the so-called new generation chassis. The 12-metre Trollino is propelled by one electric motor, boasting a power of 160 kW to 175 kW (depending on the producer and customer requirements), placed on the left side of the vehicle, before the second vehicle axle. The engine is set diagonally, to allow the crankshaft to move directly from the engine to the input of the main transmission. The 18-metre Trollino can be powered by one or two electric engines. When the single engine option is chosen, the engine is installed on the left side before the second axle. Depending on the manufacturer the vehicle will feature an engine with a power rating between 240 and 251 kW. When two engines are used, these are installed on the left side before the second and third axle. In this configuration, and depending on which manufacturer is chosen, the vehicle will feature 160

to 175 kW engines. The 24-metre Trollino is powered by two electric engines placed on the left side before the second and third axle, and each engine has a power of 160 kW.

Regardless of the length of the vehicle, the maximum speed of the trolleybus will be 70 km/h. The vehicles are equipped with air conditioning with an electric 3 x 400 V compressor. The trolleybuses are heated electrically, using an electric boiler, similarly to what is used in battery buses of the Urbino electric family. An option available for the vehicle is fitting it with traction batteries that facilitate zero-emission driving without a connection to traction wires. The Polish producer offers energy storage in the form of Solaris High Power batteries with a capacity tailored to customer requirements regarding the distance a vehicle should be able to cover when not connected to traction wires. The traction batteries can be charged in two ways: first by collecting current from the overhead line in motion, i.e. in-motion-charging. In this case electricity accumulated in the batteries is derived through a current collector from an overhead line. The second mode available is the plug-in charging known from Urbino electric buses, which allows for the recharging of a battery while the vehicle is parked at the depot. Another means of providing energy for the vehicle beyond the traction line is the installation of hydrogen fuel cells.

Hydrogen Solaris Trollino 18.75

Rigas Satiksme, the public transport operator in Latvia's capital, ordered 10 trolleybuses of the Trollino 18,75 type, equipped with hydrogen fuel cells as range extenders. It is an absolute novelty not only in Latvian public transport, but also the first and only vehicle of this kind in the world.

The Trollino for Riga was fitted with fuel hydrogen cells and batteries, which allows the vehicles to travel at least 100 kilometres without the need to be connected to traction wires. The Solaris Trollino 18,75 has been equipped with an electric engine and an auxiliary drive in the form of a 80 kW hydrogen fuel cell powering the Solaris High Power batteries with a capacity of 29.2 kWh. The fuel cell and batteries are used on those sections of the route that are devoid of traction wires. There, the trolleybuses derive energy from their batteries, which will be recharged using fuel cells. Energy from the fuel cell can also directly power the electric engine.

Produces in the Bolechowo-based factory, the Trollino are designed to provide maximum comfort to passengers. Each trolleybus for Riga can fit up to 135 passengers, of whom 44 are seated. The air-conditioned compartment will guarantee a pleasant ride regardless of the weather conditions.

Bi-articulated Solaris Trollino 24

The latest trolleybus project of Solaris' Office of Research and Development is a bi-articulated trolleybus of 24 metres. The idea behind the prototype vehicle - the new Solaris Trollino 24 - is to create a platform for the future serial production of 24-metre hybrid or electric drive vehicles and trolleybuses. The driveline of the 24-metre trolleybus will consist of two traction motors propelling the two axles. A pack of 58 kWh batteries installed in the vehicle will be charged during the drive, collecting current from the overhead line via a bipolar pantograph traditionally in use in trolleybuses. What is more, the energy accumulated in the batteries will be used to fuel the trolleybus whenever it is detached from the electric traction line. In order to ease manoeuvres in urban traffic, the fourth axle of the vehicle will be a steering axle. Featuring a unique door layout of 2-2-2-2-2, the vehicle will also be fitted with an electric power steering (EPS) system. A total of 53 seats have been provided in the passenger compartment, of which 16 are accessible from the low floor, which ought to facilitate access for passengers with reduced mobility. The producer has also provided space for wheelchairs and prams or pushchairs and a bay devised for bicycle transport.

Presented Solaris Trollino 12

The Solaris Trollino 12 presented in Berlin is one of 14 trolleybuses of standard length commissioned in 2018 by the City Hall of Gdynia. 16 articulated Trollino 18 are to be delivered together with these vehicles. The contract value is 95 million PLN (about 24 million euro).

Apart from featuring traditional trolleybus drivelines, the Solaris vehicles commissioned by Gdynia will be fitted with additional batteries which enable driving off the traction line. In the case of the 14 Solaris Trollino 12 trolleybuses, the batteries will have a capacity of 58 kWh, whereas the 16 articulated vehicles will be equipped with 87 kWh batteries. This means that both types will be able to cover a distance of dozens of kilometres in zero-emission mode without the use of a pantograph. Thanks to this solution the trolleybuses for Gdynia will be able to run in areas of the city where there is no trolleybus traction line.

The Trollino 12 presented at the InnoTrans 2018 trade fair is equipped with a 175 kW engine and 58 kWh batteries. The air-conditioned interior of the trolleybus accommodates 30 passenger seats. A separate air conditioning caters for the driver's needs. A CCTV cameras recording the vehicle's interior, as well as what is in front and behind it, has been installed to improve safety. A separate camera has been dedicated for a continuous monitoring of the pantograph. All of the lighting is made in LED technology. Four double USB charging ports are available to passengers.

Solaris has provided over 1200 trolleybuses to customers in total. Next of them are currently being assembled. Trollinos are in use in 16 countries. Take a look at the most popular model of the trolleybus in Europe, on outdoor display in the Sommergarten Bus Display.

Additional information

Mateusz Figaszewski
Institutional Partnerships and External Relations Director
Tel.: +48 61 66 72 347
Mobile: +48 601 652 179
Fax: 48 61 66 72 345
email: mateusz.figaszewski@solarisbus.com

About our company

Solaris Bus & Coach sp. z o.o. is a leading producer of city and intercity buses in Europe. It focuses on the development of low-emission and zero-emission vehicles, i. e. electric and hydrogen buses as well as trolleybuses. Over 25,000 Solaris vehicles have been delivered so far and they ply the streets in 850 towns and cities across 33 countries located throughout Europe as well as beyond it. Solaris is part of the Spanish CAF Group (Construcciones y Auxiliar de Ferrocarriles) S.A. From conception, to the design and manufacturing phases, all Solaris buses are produced in Poland. All activities undertaken by the company are in line with its mission, which is reflected in the brand's promise: to change the image of public transport. Solaris also actively partners with public transport operators and provides them with comprehensive support in their transition to zero-emission mobility. Solaris products have been repeatedly awarded for quality and innovation. The Urbino 18 hydrogen bus has won the prestigious 'Bus of the Year 2025' title.