

ELECTRIC MUNICIPAL VEHICLE

## Designed for speeds of up to 80 km/h

Baumüller has developed a drive system for electric vehicles. In a joint development it was applied to a vehicle, which can work as a sweeper, snowplow, or loader.

Apag Cosyst, Bayerisches Laserzentrum, Polyplast Sander, and SMS Engineering have developed jointly a multi-purpose vehicle. The Bavarian State Ministry of Economic Affairs and Media, Energy and Technology funded the project. Bayern Innovativ sponsored it, too. Baumüller supplied the electric drive system. The vehicle is intended for series production. It is made for speeds of up to 80 km/h and can range about 100 km. The vehicle can be used with interchangeable attachments for various municipal cleaning and maintenance work.

### Electric axle for rear and all-wheel drive

The drive system from Baumüller consists of two fully electric drives, each of which is mounted to the vehicle's rear axle. Alternatively, an all-wheel drive can also be used instead of a rear-wheel drive. The drive system consists of a Baumüller DSA synchronous axial flux motor with an integrated converter, power electronics, as well as a planetary gear and was specifically developed for this funded project. The planetary gear is located in the rim of the rear wheel and is directly connected to the drive system. This has the advantage that there are fewer transmission losses, since an additional drive train, such as a cardan shaft, drive shaft or differential, is not necessary. Additional advantages of the drive system are increased application flexibility and improved driving comfort. In addition, the drive is very capable of handling overload, i.e. gradients of up to 18 percent can be managed.

The special feature about the rugged designed DSA motor with a rated output of 18 kW is the winding switchover. This allows an automatic gear change of the municipal vehicle from a working gear to a high-speed gear. The switchover makes it possible to achieve different torques and speeds, which are automatically adjusted to the application area and speed via the motor controller developed by Baumüller. This means that in the first stage, the working gear, i.e. when sweeping or mowing, a doubled rated torque is achieved at only half the speed. This level is used for speeds of 40 km/h or less. The energy source is not burdened with large currents here, which allows for a greater range and a longer operating duration than before. With the second stage, the high-speed gear that permits speeds of up to 80 km/h, a rated torque is generated and the full speed is reached in the process. Despite the higher speed, the power requirement still corresponds to that of the first stage. The degree of efficiency also remains very high, thus allowing for greater range and a longer operating duration, said the company.

The installation space of this electric axle (motor and converter) was optimally adapted to the installation conditions in the vehicle due to its small dimensions of nearly 414 mm in length and 300 mm in diameter.

### With CANopen connectivity

The electric powered vehicle uses CANopen to connect the drive system to the vehicle controller. The mutual monitoring of both drive controllers of the B Maxx series as well as all key safety measures affecting the drive were also realized.

The vehicle with a length of 3,4 m and a width of 1,4 m can generate energy when braking and driving downhill, which is then fed back into the three battery modules, each with 8,5 kWh. This also improves the range and energy balance.



*The municipal vehicle developed jointly in a research project is intended for series production and can achieve ranges up to 100 km (Photo: Baumüller)*



*The electric axle consists of a DSA synchronous external rotor motor with planetary gear and integrated line electronics with motor controller and converter (Photo: Baumüller)*

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