

Combustion engine remains essential for agricultural machinery

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Transportation technologies are constantly changing, leveraging permanent innovation to meet customer requirements and market needs. For some, the future may be electric. For others, such as agricultural machinery, running on high power density diesel fuel with internal combustion engines is unlikely to change in the foreseeable future to other technologies. CEMA, the European Agricultural Machinery industry Association, is strongly convinced that the internal combustion engine remains essential for agricultural machinery. Not as a technology of the past, but as an enabler of our common future.

Farmers across Europe will still need combustion engines to grow food, feed and agricultural raw materials affordably and sustainably to compete in a global market for the following main reasons:

- **Power density and packaging constraints:** Agricultural machinery is used in various situations, from spraying fields to harvesting grain. Often the same machinery is used for relatively light (e.g. light transportation) and heavy applications (e.g. ploughing). This requires the machinery to be versatile and powerful at the same time. In addition, it might be required to provide the full power for many hours per day, which is only possible with an on-board energy storage of high density. Furthermore, the machine needs to manoeuvre easily and be adapted to both the crop environment and driving on public roads. These requirements create packaging constraints for fitting engines, drivetrains and energy storage. Due to potential contact to organic material in agricultural application, certain surface temperature limits need always to be controlled as well. This has led in the past to severe issues with current battery technology in some applications and further increases packaging constraints.
- **Time and reliability constraints:** Labour cost and time constraints are major factors for farmers and contractors. Additionally, in many cases work in the fields needs to be carried out in time-critical situations. For example, during the harvesting season, machinery needs to work 24/7 with minimal downtime. Maintenance or repair during that time has to be avoided by employing equipment with reliable technology which is proven to provide the farmer with consistent usage will remain the preferred option. Long periods of charging batteries, as is common with today's technology, reduce significantly the availability of machinery during critical harvesting time windows.
- **Application area constraints:** Additionally, the locations where agricultural machinery is used are mostly rural areas further away from towns and villages. In urban areas, new technologies might be pioneered and become widely used provided volumes drive the needed investment in infrastructure such as charging points. In rural areas, particularly on the field, such infrastructure is currently absent and more difficult to install. Machinery equipped with combustion engines can be easily re-fuelled in

the field, with the needed flexibility. Providing various and heavy battery packs in the field when needed would prove way too cumbersome.

- **Micro-economical constraints:** Beyond technical constraints, customers investing in agricultural machinery will continue to take a practical and micro economical view. Electrically powered agricultural machinery attracts a significantly higher price. Such vehicles and implements will become more attractive when their application results in a significant increase in productivity throughout the agricultural season. If this is not the case, customers will stay with conventional proven technology. Actually, significant advantages are not expected for the vast majority of European farmers and applications. In some particular applications - such as mowing of inner city greens – the assessment may still be different. However, such constraints will not affect the major share of agricultural machinery customers and scale effects regarding cost reductions for electrification by such niche applications are not expected.

- **Ecological constraints:** Electrification of the complete transport sector is not always beneficial for the environment, as the way electric energy is produced has always to be taken into account. The current percentage of renewable European production of electricity is relatively low. Thus, electrification needs in parallel of its market extension a further development of pollutant and greenhouse gas neutral energy production to harvest ecological benefits. Furthermore, it has to be considered that replacing the equivalent energy content of liquid mineral based fuels requires a surplus in environmental friendly electricity production and storage.

Moreover, combustion engines – in particular those for agricultural machinery – have undergone an unprecedented reduction of pollutant emissions in the last twenty years. The most prominent pollutants nitrogen oxides and particulates have been reduced by more than 95 % and 98 % respectively.

- **Other fuels considered as better alternatives:** There are various other fuels using internal combustion engines considered as better alternatives than electrification. From a CO₂ perspective, alternative fuels can have the same impact. When so-called designer fuels like Power-to-X or BtL, become available at reasonable costs, combustion engines will become CO₂ neutral. Until that point, CO₂-neutral operations are already possible by using bio-fuel or bio-gas capable combustion engines. Using these fuels will provide clear benefits to users above electrification, as the internal combustion engine can be used with all its benefits.

Taking all these arguments into account, switching immediately to the electrification of the complete transport sector is not the appropriate strategy. Combustion engines have and will continue to offer environmental advantages in agricultural machinery.

CEMA, the European association representing the agricultural machinery industry, strongly believes that the internal combustion engine is currently the only available technology that can meet the variety of market requirements regarding power, working range and packaging constraints. At the moment, there is no other technology available that can provide the same flexibility to serve in various agricultural applications.

Farmers need to carry out the work they need to do in the necessary timeframe. Therefore, CEMA is convinced that it is of utmost importance that there won't be any limitations that impact the possibility to have internal combustion engines with high-density fuels in agricultural machinery.

CEMA

CEMA is the European association representing the agricultural machinery industry. For 50 years CEMA has acted as a network of national associations and provides services, advice and a common European industry view on relevant topics. The industry represented by CEMA includes 4,500 manufacturers of agricultural equipment employing directly 135,000 persons and indirectly in the distribution and service network another 125,000 persons. The companies are mainly small and medium-sized manufacturers according to the EU definition and they have a total turnover of 26 billion euro.