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„Faszinating tractors“ – highlights of the 15th Hohenheim Field Day

The 15. Hohenheim Field day was held at the 12th of September 2009 at late summer weather. On an annual basis the Institute of Agricultural Engineering of the University of Hohenheim together with the German Agricultural Museum and the Station für Animal Husbandry and Organic Farming organise this great show of farm machinery. The demonstration of historic and modern technology takes place on the grounds at the Hohenheim Meiereihof, an experimental dairy farm at the nearby Hohenheim castle. Since 1818 agricultural students learn at Hohenheim about modern farming methods and gain experience by working with the latest farming equipment. At the field day 2009 almost a century of tractor history was on the focus and the rapid changes in technology were displayed. It became apparent that tractors still have a great future.

Keywords
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Abstract
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The pressure on worldwide agriculture increase steadily. Should it succeed in satisfying the hunger of the 6.8 billion humans currently on Earth and in supplying them with sufficient amounts of renewable energy as well, then a further increase in the number of high performance tractors will be needed.

A worldwide, but very differentiated, market

No one really knows the global tractor count but it should be around 30 million. Every year presently another 800,000 or so join them. Most of the new tractors appear in the emergent countries of Asia including India, China with Iran and Turkey also prominent in this context. In the meantime India has established itself as tractor land no. 1 with an annual production of over 300,000. Japan is also a big player producing around 200,000 per year. While it is true that most of the Asiatic tractors don’t stand too much comparison with North American and European hi-tech machines, the Kubota, Iseki, Mahindra and Yanmar machines shouldn’t be underestimated. And when the price:performance relationship is right, these tractors from the east have no difficulty finding markets in the western industrial countries too.

Conversely, North American and western European tractor manufacturers from AGCO, Case, Claas and John Deere right through to SDF have included the Asiatic regions in their strategies for a long time now, be it over joint ventures, or with lower-priced technically slimmed-down models. As „classic“ versions they contribute to the building-up of currently developing agricultural sectors through offering tested technology at affordable prices. This also applies to the eastern European market. Here, uncomplicated, robust and, above all strong

Fig. 1

Lanz Bulldog HL 12, from 1923, built as selfpropelled heavy-oil engine

Fig. 2

Prof. Dr.-Ing. Renius presented a Fordson model F tractor from 1924 at Hohenheim Field day

draught tractors are still in demand; tractors that can spend the winter outside without the electrics breaking down.

Manufacturers offer a wide variety

Meanwhile the perfecting of hi-tech tractors continues unabated. Engines with reduced emissions, electrical drive, stepless transmissions, GPS-assisted steering, more suspension comfort and engines able to run on vegetable oil are only a few of the fields successfully profiled by constructors within the tractor concerns. The dynamics of tractor development will further accelerate. Where the Olympiad aspirations for tractor manufacturers just a few years ago could be described as „bigger, stronger, faster“, now they include more fuel savings, operator comfort and reliability of hydraulic and electronic components.

Gone are the times when it was accepted that: „The tractor stinks and belches smoke and never works when needed“ - although, interestingly, this state of affairs did nothing to damage the reputation of tractors in the 1920s. As harbinger for a new, mechanised, agriculture the tractor's weaknesses were seen as problems soon to be overcome. At the Hohenheim Field Day one saw this in tractors from between the world wars such as the Lanz Bulldog HL 12 and the Fordson Model F. These two machines (from 1923 and 1924 respectively) represented separate concepts: the European development and the North American one. Differing also was the motorisation. In Europe, the single-cylinder 2-stroke hot bulb engine able to operate on a variety of fuels (**figure 1**); in America, the weight-sparing Fordson, designed without chassis, and powered by a 4-cylinder 4-stroke petroleum engine (**figure 2**). The low petroleum price led to this engine being selected as economy always had great importance in Ford strategies. That there were cost advantages to be achieved through high production numbers had already become clear to the company in the production of its Tin Lizzy (Model T) car. Now, it hoped that success with the tractor would lead to lower unit costs. In fact, this Fordson became the first tractor to be built on assembly line and also the annual production of over 100,000 units set a never-before reached standard.

Wartime

That crisis periods spur constructors onto unconventional solutions could be demonstrated at Hohenheim Field Day with a 1941 Fendt HG 25 Dieselross. Developed as „child of necessity“, the wood-gasifier tractor was able to run on solid fuels such as peat or wood. The thumb rule was that one litre of diesel could be replaced by 3 to 3.5 kg wood. Especially suitable as fuel has proved dried beech wood in small (approx. 7 cm by 4 cm) pieces. But birch, pine, spruce or ash were all acceptable. Between 1942 and 1948 agriculture was helped to keep going with wood-gasifier tractors from Fahr to Lanz. But as soon as liquid fuel became available in sufficient quantities tractors were converted to diesel. In the meantime wood-gasifier power is regarded as technically possible but uneconomical. Alongside the approx. 5000€ calculated conversion costs there are also high running costs, not to mention the operational input required.

Engineering blossoms-out from 1945

Post-war constructors took everyone by surprise with a cornucopia of interesting tractor conceptions. As if released, they worked on almost every vehicle component from engine over transmission to electrics and driver seat. Numerous innovative solutions made their appearance. For example the Unimog at the end of the 1940s from the gold and silverware factory of Erhard & Sons, Schwäbisch Gmünd. Four same-size wheels, 4-wheel-drive, operator cab up-front, load platform and a 4-cylinder 18.6 kW (25 HP) diesel engine from automobile manufacture typified this vehicle – a model that founded the “system tractor” category. At Hohenheim not only the oldest surviving Unimog model U5 (1946/48) was on show but also other veteran representatives of various earlier Unimog series. Especially eye-catching was the demonstration of 60 years of Unimog development when the oldest Unimog entered the ring in the company of a 171.5 kW (230 HP) Unimog from the present 400 series. From size to engine power through to styling, just about everything has changed over the years although the ground philosophy of the vehicle remains the same (**figure 3**).

As further evidence of the spirit of invention in post-war

Fig. 3

The modern Unimog type U 400 (centre) together with two historic Unimog. Unimog U 5 (right), the oldest Unimog known, is owned by the German Agricultural Museum

Fig. 4

With his innovations, the Irish Harry Ferguson entered a new tractor generation after WW II. In 1957 Ferguson built the Model F 35 Golden Grey, the first ever built tractor with a golden painted engine

Fig. 5

The Case Quadtrac 485 represents high performance and strong power with reduced soil compaction

times several Ferguson tractors made it to the presentation. Developed from 1946 by the Irish inventor Harry Ferguson they offered options of 4-cylinder, 4-stroke petroleum, petrol or diesel engines. Shared by all Ferguson tractors: the 3-point hitch and hydraulics that enabled the tractor to became a unit with the implement and could be comfortably operated from the driver seat. With their technology Ferguson tractors changed the international tractor market and defined the equipment profile that has developed into a standard for international tractor construction. The position of Ferguson was so strong that in 1957 the company was able to produce a series model in gold. At the Hohenheim Field Day such a model – the Ferguson FE 35 Golden Grey - was presented, a tractor that opened a new epoch in tractor design (**figure 4**).

Impossible to leave out of any tractor history are Porsche diesel tractors. The range stretched from Junior to Master and featured the first application of modular systems. Simplified servicing and easier spare part logistics played a role in the introduction of modular tractor design. But the Porsche constructors also set standards in technology. In 1959 they presented at the Cologne DLG show the first hydrostatic tractor to be built in Germany, the „Super X“. This is still operational 50 years after its premier and is as fascinating as ever with its elegant design.

Conclusions

Altogether, more than 70 milestones in tractor technology from over 80 years were presented at Hohenheim. Under the large tractors presented, the St Petersburg-built Kirovets K700 A drew the glances of the crowds. The 12 t and 171.5 kW (230 HP) tractor doesn't offer much in the way of operator comfort and with that differs decisively from the big western tractors such as Claas Xerion 3800, John Deere 8345 or Fendt Vario 930. They all demonstrated their technical "muscle" in practical operations with heavy cultivation implements. A final record was achieved by the Case Quadtrac 485 (**figure 5**) that had travelled from the east of Germany to Hohenheim. With its 407 kW (546 HP) this tractor is so far the most powerful ever at Hohenheim which, given the 191 year history of the university, is a remarkable claim.

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