GENERAL LECTURE:

DISPLACEMENT MACHINES - KEY ELEMENTS OF FUTURE TECHNOLOGY

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Fluid Power displacement machines are still by far the dominant power transfer principles in mobile machinery. Power density, simple continuous variability for rotary and linear drives as well as straight forward repair and service concepts have enabled this technology a very successful development in the last decades. This general lecture will critically analyze if and how those drive line elements will be Key Elements of Future Technology in this market in the future, especially under the view that battery technologies are facing many challenges for powerful machines with intense duty cycles (see also automotive industry). Considering for example the fork lift, it is an application where various technologies can be found inside today, focused on different application conditions and sales channels. But the more powerful and heavy mobile machines are, it is still mainly the traditional concept powered by a combustion engine. However, this can be also seen as a circle of devil, because it is well known that the total efficiency (power-in/power-out) for hydraulic drives is in many cases quite low. I.e. not improving this energy balance or not creating synergies between hydraulics and other technologies, will hinder even hybrid systems to enter the market and to foster advanced technologies. That is why a change usually starts as a combination or extension with the somehow existing technology, and not with a drastic revolution, for which the market including distributors, service/repair centers, etc. in various regions are not prepared. For mobile machines in the field, still reliability and up-time are key to success, what needs to be carefully regarded when considering new technologies into a conservative and cost competitive market.

One aspect or even advantage of hydraulic displacement machines, in particular for motors, is the immediate availability of torque.

Nevertheless, as all mechanical rotary components, there is friction basically following the Stribeck curve. The lecture will also explain that special attention needs to be paid to loss modeling, in particular in the low speed area, in order to ensure that the prediction is well suited as Key Elements of Future Technology. Due to the multi-dimensional and non-linear loss behavior, other physical behavior based modeling approaches are required for a reliable performance picture - than advanced mathematic inter- or extrapolation.