Agriculture is going digital

LieberLieber Software: Agriculture is going digital

In 2021, the German agricultural engineering family group CLAAS generated sales of 4.8 billion euros with around 11,900 employees. Within the group, CLAAS E-Systems is responsible for the development of electrical and electronic systems for agricultural machinery. Enterprise Architect has been used there for many years as the standard editor for modelling SysML and UML models. Now, LemonTree has also been added to the engineering tool chain. For the realisation of future digitisation projects, powerful tools are thus available to apply the necessary development processes and methods in a targeted and efficient manner.

Vienna/Dissen – In the future, there will also be an increased focus on digitalisation in agriculture, which is associated with specific requirements for the machines and systems used in this industry. Within the CLAAS Group, CLAAS E-Systems is responsible for the development of electrical and electronic systems for agricultural machinery. Enterprise Architect has been used there for many years as the standard editor for modelling SysML and UML models. Now, LemonTree has also been added to the engineering tool chain. Dipl.-Ing. (FH) Theodor Jäger, Systems Engineering Coach at CLAAS E-Systems in Dissen, Lower Saxony, comments: „The tractor cab of the future will be much more strongly characterised by software than it is today. We have to adapt to this and find ways to deal with increasing system complexity efficiently and effectively. In the course of these changes, document-centred systems development is reaching its limits; it is no longer up to date and is taking a back seat. For us, there is no other viable alternative than the transition to model-based systems engineering (MBSE). At the end of this transformation, the system model takes centre stage, whereby models are the key repository for information ('single source of truth'), from which views of the model are generated, such as in the form of documents. The importance of Sys-

Picture: CLAAS

Dipl.-Ing. (FH) Theodor Jäger
Systems Engineering Coach at Claas E-Systems

Combine harvester from CLAAS

ML, UML and other models for system development thus takes on a completely new level of significance. Enterprise Architect as a modelling platform and LemonTree as an enabler for current versioning of the models are crucial to achieving this goal."

Making systems engineering easier

When Jäger joined CLAAS E-Systems about two and a half years ago, he brought with him more than 20 years of experience in the development of mechatronic systems. At an automotive supplier in Sauerland, he developed mechatronic systems in international projects in various roles and positions. As a coach for processes, methods and tools, he most recently supported project teams in modelling their systems in SysML.

Jäger is particularly concerned with keeping systems engineering simple. In doing so, he heeds the advice of physicist and Nobel Prize winner Richard Feynman: „If you cannot explain something in simple terms, you don't understand it." Jäger translates this with regard to MBSE and explains: „People also need MBSE to be presented and communicated in a way that fits into today's working environment: Simple, with catchy explanations, concise pictures, in small servings. Hardly anyone reads a ten-page text nowadays. Even if the benefit of an activity is not immediately clear, motivation decreases. Only if it is meaningful and simple, and in the best case also fun, will new methods and processes be accepted in the organisation and also be brought into everyday use beyond locational boundaries."

Holistic system development with MBSE

„During harvesting, the customer must experience no system malfunctions. Therefore, we must achieve this goal with our MBSE approach: Fewer faults with increasing complexity," notes Jäger. After all, agricultural machinery must be very reliable, and its unrestricted availability during the harvesting season is a top priority. So, when the complexity of the machines increases, this must not affect their availability, and failures must be avoided at all costs.

In addition to his experience with Enterprise Architect in modelling mechatronic systems, Jäger also brings his expertise with regard to LemonTree to CLAAS. His aspiration is to be able to further develop and maintain models in accordance with their future significance in a secure, process-compliant manner, which is best achieved using the methods and concepts that have already proven themselves in classic software development. „Being able to develop, version and organise software and models with the same methods and tools is the ideal way.

This eliminates tool break between the system and software worlds." In any case, LemonTree was convincing in a proof of concept carried out specifically for this purpose: functions such as comparing, differencing and merging models, dependency analysis or simple versioning were very well received. As a result, LemonTree has become an integral part of the engineering tool chain at CLAAS E-Systems.

Close cooperation with LieberLieber on modelling

The cooperation with LieberLieber is very good, for example because of the fast support offered, a common language and time zone. Last but not least, mutual appreciation and trust. For Jäger, the support behind the tools via support and consulting is essential: „There are always questions that can be better clarified together. That saves time and money, and there is more time for engineering to provide top-class services. LieberLieber also realises individual adaptations quickly. Furthermore, the licence costs are moderate and the users get along very well with the tools."

Dr Konrad Wieland, CEO of LieberLieber: „We already knew Theodor Jäger from projects in the automotive industry and are very pleased to now be able to support major digitisation projects at CLAAS together with him. Agricultural engineering is also facing major upheavals similar to those in the automotive industry. For example, new and stricter legal norms and standards, especially in the area of safety and security, are an issue in agricultural engineering. But they can be mastered very well with MBSE and our tools. In any case, we will continue to expand our service and support in order to be able to serve CLAAS in the best possible way.

Dr. Konrad Wieland
CEO of LieberLieber Software

We already knew Theodor Jäger from projects in the automotive industry and are very pleased to now be able to support major digitisation projects at CLAAS together with him. Agricultural engineering is also facing major upheavals similar to those in the automotive industry. For example, new and stricter legal norms and standards, especially in the area of safety and security, are an issue in agricultural engineering. But they can be mastered very well with MBSE and our tools. In any case, we will continue to expand our service and support in order to be able to serve CLAAS in the best possible way.

All digitally collected information flows together in the tractor cab.

Implementing legal regulations safely

The operator's cab of an agricultural machine is where all the information comes together and is made available to the operator. All machine activities are initiated from the cab and many are safety-related. The development process for agricultural machinery must therefore comply with ISO 25119, the standard for functional safety in agricultural machinery. However, functional safety only exists if the software does exactly what it was built for. And that is guaranteed by ISO 21434, the standard of cybersecurity for road vehicles. „The modelling of the system architectures with Enterprise Architect and the use of LemonTree for model comparison and model versioning systematically support us in this and thus create an important working basis for meeting these standards," concludes Jäger..

ISO 25119: Software development for machinery in agriculture and forestry

ISO 25119 specifies an approach for the assessment, design and verification of safety-related parts on agricultural and forestry machinery. Like ISO 26262 for the automotive industry, ISO 25119 requires a functional safety concept and a technical safety concept.

ISO 25119 consists of four parts. The first part mainly defines the management aspects of a functional safety project. The second part discusses the necessary safety concept and the requirements for risk and hazard analysis. The third part deals with hardware and software development as well as test requirements. The fourth part is about functional safety aspects in production, operation and changes.

ABOUT CLAAS E-SYSTEMS

Whether you are a large-scale enterprise, a contractor or an individual farmer, we know what drives farmers today and tomorrow. With more than 30 years of experience, we understand agribusiness and its processes. As an integrated partner in the CLAAS Group for electronic systems, we develop innovative, intelligent products.

We bundle CLAAS' electronics expertise under the name EASY. The abbreviation stands for Efficient Agriculture Systems and delivers what it promises: from machine optimisation to steering systems and fleet monitoring via TELEMATICS to farm management software, EASY makes everything very simple. You can perfectly coordinate your systems and get the best out of your machines, your drivers and thus your farm.

In addition, we act as a partner in various development cooperations and are active as an original equipment manufacturer for machine manufacturers with one of our main focuses.

We have been setting standards in our business fields for decades with strong ideas and practical solutions. We make leading technologies available to large farms, contractors and individual farmers.

You can find more information at www.claas.de

ABOUT LIEBERLIEBER SOFTWARE

We are a software engineering company. The know-how of our employees lies in model-based software and system design based on tools such as Enterprise Architect from Sparx Systems.

Our customers are companies that place particular importance on the quality of their software and systems development. They wish to maintain a constant overview of their complex development scenarios while ensuring that security-relevant requirements are clearly represented in models.

For this task we provide our own special tools, such as LemonTree and Embedded Engineer. In addition, we offer a range of useful tool integration services to help make our customers' development processes more productive.

LieberLieber is a business unit of Lieber.Group.
More information: www.lieberlieber.com