

Improving Fluid Power System Simulation Through An AAS-Based Simulation Framework

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ABSTRACT This contribution introduces a simulation framework to significantly improve the simulation-based engineering process based on the Asset Administration Shell (AAS). The current simulation-based engineering process is characterized by long development times, high error susceptibility, and low availability of suitable simulation models. These deficits are addressed by seamlessly linking component data and encapsulated simulation models. Seamless linking is realized based on the AAS, a concept for realizing virtual representations of an asset [1]. The encapsulation enables better availability of simulation models in the engineering process by allowing stakeholders to exchange simulation models domain- and tool-independently. For this purpose, the Functional Mock-up Interface (FMI) is used, and coupling mechanisms for a component-based encapsulation of fluid power simulation models are presented. Based on the AAS, linking component data and encapsulated simulation models is realized to parameterize the simulation models and reduce the long development time and error susceptibility. Therefore, three functionalities have been developed based on the AAS data model. The first functionality allows searching and finding components or component simulation models from repositories of relevant stakeholders. As a result, individual components can be requested from specific component manufacturers during the development process. The second functionality enables domain- and tool-independent integration of simulation models into a simulation environment by using automatic parameterization or direct integration of encapsulated simulation models. Automatic parameterization reduces the time required and possible susceptibility to errors during manual parameterization, a task requiring integrating many different parameter sources. Finally, the third functionality enables bidirectional synchronization between field devices and component simulation models. As a result, the machine manufacturer can offer simulation model-based error support to the operator or assist the operator during commissioning. These functionalities result in a concept for a new AAS based simulation framework, shown in this contribution. The concept is a solution for mentioned deficits in the simulation-based engineering process.

Keywords: Fluid Power Systems, Modelling and Simulation, System design, Industrial Internet of Things, Asset Administration Shell, Functional Mock-up Interface, Functional Mock-up Unit

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