COSMHYC/COSMHYC XL INTERVIEW

Interview with Jan Zerhusen, Senior Project Manager at Ludwig-Bölkow-Systemtechnik (LBST), giving insights into techno-economic assessment in the field of hydrogen and the COSMHYC XL project.

Jan Zerhusen is Senior Project Manager at LBST. His expert areas include power plant and hydrogen technologies, energy storage systems, and renewable energies. He holds a degree in mechanical engineering from Munich University of Applied Sciences. Among his latest published research is a detailed comparison of nationwide infrastructures for the supply of energy to battery and fuel cell passenger cars. Above that, he was and is involved in various EU-funded projects where his responsibilities include technical and economic evaluations (e.g. HyTransfer, H2REF, HyLift Europe, COSMHYC and COSMHYC XL).

Ludwig-Bölkow-Systemtechnik (LBST) is an expert consultancy for sustainable energy and mobility. With expertise bridging technologies, markets, and policy LBST supports international clients from industry, finance, politics, and non-governmental organisations in strategy, feasibility, and market assessments. Particular expertise exists in energy storage, hydrogen and fuel cells, alternative fuels and their infrastructures. A key common denominator of all activities is the rigorous system approach, making sure all relevant elements of a tightly networked system are taken into account and providing LBST partners and customers with a comprehensive and reliable basis for their decisions.

In COSMHYC XL LBST is analysing requirements of large-scale FC transport applications towards hydrogen compression and refuelling stations to pinpoint project's technology development. The techno-economic analysis highlights the advantages of the new compression approach.

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Starting with a provocative and already often asked question: Battery or fuel cell electric vehicles? Which vehicle type will play a major role in the energy transformation?

Today, it is widely accepted that both vehicle technologies are required to reduce GHG emissions to zero. However, the exact share of battery versus fuel cell technology will depend on various aspects such as the vehicle segment, future technology developments and the vehicle utilization. Long-range and heavy-duty vehicles will rather use hydrogen and fuel cells, while battery technology might be dominant in smaller vehicles or for shorter transport. The often-quoted argument regarding the superior efficiency of battery vehicles is, in my opinion, misleading. Looking at the energy system as a whole, including its dimensions space and time, the efficiency of both fuel supply pathways converge.

Studies show, that hydrogen mobility is especially interesting for large-scale transport applications. Could you please give us an outlook for which large-scale transport applications the compressor technology developed in COSMHYC XL will be the most relevant?

Hydrogen and fuel cells can be relevant to various large-scale transport applications. In our analysis for COSMHYC XL we have identified that the compression technology developed in the project will be the most relevant for busses, trucks and regional trains. Those FC vehicles will be available on the market in larger numbers already in a few years and will require very similar large-scale refuelling infrastructures. In addition, the nominal pressure level of the tanks in those vehicles is 35 MPa in Europe. This allows to address all of those large-scale transport applications with the same hybrid compressor product. This makes it overall an attractive market to address with the COSMHYC XL technology.

Your work in COSMHYC XL involves the techno-economic analysis of the new hybrid compressor in comparison with state-of-the-art technologies. What are the main steps of such an assessment and why is such a study relevant?

The very first step is the proper definition of the most relevant compressor application(s). In our case it is e.g. refuelling of vehicles at 35 MPa and with rather large vehicle tanks of 20 to 200 kg capacity. The refuelling profile including refuelling duration, frequency, plannability and repeatability is also of importance. For the COSMHYC XL hybrid compressor technology, the availability of external heat to drive the metal hydride compressor is also an important topic. Thus, the definition of likely locations of the refuelling station (e.g. bus depot) and possibly available heat sources and sinks needs to be defined.

With well defined boundary conditions, a well-to-tank economic model is being build. This enables us to identify main cost drivers and to analyse the impact of single parameters (e.g. heat costs) on total costs of the compression. The benchmark against state-of-the-art technology allows us to identify the most attractive and relevant set of parameters for our new compression technology to be economically successful in the future. In addition, efficiencies and GHG emissions are also assessed. This helps to communicate technology advantages to future customers. Thus, a techno-economic analysis is key to understand future market opportunities.

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Are there already results of the COSMHYC XL techno-economic analysis available?

The techno-economic analysis is usually conducted in the second half of a project. Then, first real-world cost and performance data is already available. Thus, we do not have results from that analysis available, yet. However, we have started to collect (benchmark) data and build up the required models.

Results we already have available relate to the cost optimized configuration of the hybrid compressor. This means optimizing the balance and capacities of both compression technologies (metal hydride and mechanical compressor) and intermediate storages for different refuelling applications. The results totally confirm our expectations regarding overall system configuration. Especially relevant to us is the identified high robustness of the results to changing parameters. The identified configuration is cost optimal for a wide set of applications and boundary conditions. This is important to be able to design a “of the shelf” compressor product with limited adaptions required for each single compressor application.

Thank you for your time and this interesting interview, Jan.

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