Siemens 2019 Simcenter Conference

CIMdata Commentary

Key takeaways:

- *Siemens Digital Industries Software's 2019 Simcenter conference, held in Amsterdam, The Netherlands, was packed with more than 150 comprehensive customer, product update, and training sessions.*
- *The multi-industry applicability of Siemens' Simcenter multi-physics simulation and test solution portfolio was demonstrated by their customers throughout the event.*
- *The depth and breadth of Simcenter has its roots in a host of acquisitions, as well as solutions that have been organically developed and enhanced working with customers.*
- *The synergy between Siemens' extensive test and simulation & analysis solution portfolio was showcased, along with how they complement each other, to improve the entire product development verification and validation process.*
- *Simcenter is a core element of Siemens' Xcelerator portfolio of solutions for enterprise innovation.*

Recently, CIMdata had the opportunity to attend Siemens Digital Industries Software's 2019 Simcenter Conference. This three-day event held in Amsterdam, The Netherlands, on December 2-4, 2019 gave attendees the opportunity to experience more than 150 customer, product update, and training sessions. It showcased Siemens Digital Industries Software's (Siemens) deep and broad solution portfolio for simulation, analysis, and test, and the significance of its combination. The conference had about 600 attendees, who came from throughout Europe and other major regions of the world. While it was a Siemens conference, a number of third-party sponsors also participated, highlighting the openness and portability of the solutions, including Rescale (a leading simulation and HPC solution provider), ThermoAnalytics (specialists in thermal simulation), cards PLM Solutions (a Siemens Smart Expert Platinum Partner), SDC Verifier (a leading provider of offshore FEA solutions), Gompute (a leading HPC Cloud Platform provider), and Mevea (a leading provider of advanced digital twin software- and hardware-based solutions). It was great to see so many technical experts discuss and demonstrate how Siemens various simulation, analysis, and test solutions are making a difference in how companies innovate while designing, manufacturing, and supporting their products.[1]

Keynote Addresses

The 2019 Simcenter Conference kicked off with a set of keynote presentations that illustrated Siemens' solutions in action, as well as the company's thought leadership and ability to work with some of the leading practitioners worldwide. First up was Mr. Henrik Alfredsson, Managing Director, Aker Solution Sweden, AB. His talk focused on how his company uses various Siemens simulation and analysis (S&A) solutions to enable them to provide targeted support for the world's energy transition to new and improved sources. He stressed the need to change our sources of energy, as well as our need to design and deliver solutions that get the most out of the natural resources the energy industry is already tapping into. To illustrate, he described Aker Solutions' work on subsea compression and their use of key design technologies to

[1] Travel and/or other expenses related to this commentary were provided by Siemens.

develop these solutions, including the definition of a comprehensive digital twin, and how these twins are being used to eliminate risk during the design and handoff/commissioning phases of these highly complex and costly projects. He also described how multiphase flow split can be predictively modeled with Simcenter STAR-CCM+ in subsea production. This kind of modeling is critical for these types of projects, where the cost in time and money for getting it right the first time being always cheaper.

Dr. Hannah Fry, mathematician and science presenter, was up next. Her thought-provoking presentation focused on "How to be Human in the Age of the Machine." She tested the audience multiple times during her presentation with challenging questions, such as, "Would you trust an algorithm to send someone to jail?" and what about "…to diagnose someone with cancer?" She discussed a world of the good, the bad, and the ugly of algorithms that are already in use around us. She also asked the question if we should blindly rely on algorithms and just trust them and the individuals who wrote them, that they know what is best. Additionally, she described limits that some algorithms have, as well as whether algorithms are really an improvement on the humans they are replacing. For many, the debate is simple, human first or machine first. Of course, in reality, the human is always first, for now. Because now it is the human who is writing and installing these algorithms, but what about in the future, when algorithms may actually write and run other algorithms? Will they really become self-aware? Perhaps, perhaps not…only time will tell. But for now, the question is still valid—which goes first? From CIMdata's point of view, the best way is to place the human first and use algorithms to augment the human with capabilities and data to make better and quicker decisions.

Professor, Dr. Constantinos Stavrinidis, Technical Director, IABG (INDUSTRIEANLAGEN-BETRIEBSGESELLSCHAFT MBH) spoke next. Dr. Stavrinidis is a world-renowned expert in structures and mechanical systems. With more than forty years of experience in his field, Dr. Stavrinidis provided the audience with fourteen insights that he has learned while working on multiple European Space Agency (ESA) satellite and launcher projects. He started by describing why the basics matter. In other words, if you can't add correctly, then good luck trying to multiply. His fifth lesson was, "Don't lose focus on the purpose of the activity to be performed." Meaning, don't perform a simulation without knowing why you are performing it. His ninth lesson proclaimed, "There is no substitute for experience." And his last two stated, "Imagination is powerful" and "Knowledge is not a privilege, it has to be earned through hard work." His fourteen lessons all were insightful and useful. While, like the previous presenter, his talk didn't go into any details around S&A and testing per se, it did provide significant thought leadership insight that all attendees could take back to their companies and apply.

The fourth keynote was Mr. Gugliemo Caviasso, Head of Performance Integration & Validation at the luxury and high-performance automobile manufacturer, Maserati. Mr. Caviasso focused his presentation on various simulation and test solutions used by Maserati and how they have enabled the company to deliver even better products, more quickly. In his presentation, entitled "The challenge to design and release unique performance," Mr. Caviasso described how Maserati is using various Siemens solutions to enable their comprehensive validation and verification (V&V) requirements. He also described Maserati's "virtual proving ground," and how they are using digital tools to perform tasks that once were only accomplished through physical testing. Maserati's V&V enablement journey is both practical and innovative, and their application of Simcenter is similar to that of many other leading industrial companies.

The final keynote address was given by Dr. Jan Leuridan, Senior Vice-President in charge of Siemens extensive set of Simulation and Test solutions. Dr. Leuridan closed the morning addresses with a presentation describing how Siemens Simcenter is enabling customers to

achieve a comprehensive digital twin strategy. It is worth noting that he placed emphasis on how their customers are using Simcenter to accelerate product and process innovation, by frontloading V&V into their product development processes and enabling transformations in product engineering through technology supporting Generative Engineering, Model-Based Development, and closed-loop performance engineering. He stressed the industry's need to make models (i.e., product model/information model) pervasive throughout the product lifecycle—starting with a virtual representation at the beginning of the lifecycle, and creating and managing a comprehensive performance-focused digital twin during a product's in-service phase.

Finally, Dr. Leuridan described some key advances now being made available in Siemens simulation and test solution portfolio. Two of the most notable advances include the increasing incorporation of artificial intelligence and machine learning (AI/ML) techniques and capabilities, and their announcement of a token licensing model that will be available across their entire platform in 2020. Dr. Leuridan painted a clear picture of where Siemens is and where it is going. He also touched on the closed-loop nature of their full simulation and test solution offering. While there are a number of large competitors in the simulation domain, Siemens is fairly unique in that they not only provide multi-physics and multi-domain S&A solutions, but also offer many of the tools needed to correlate, enhance, and validate simulation models (both system level and sub-system/component level) through physical test data acquisition and analysis—an area that has helped them become very knowledgeable in one of the critical aspects of real-world Internet of Things (IoT) enablement (i.e., they know how to connect the real-world data to the digital world models).

Select Breakout Session Highlights

Over the next day and a half, the conference attendees had the opportunity to attend more than 150 customer-led breakout sessions generally organized around industries (e.g., automotive, process, energy, aerospace, heavy equipment, marine, and electronics). Other sessions were led by various leading academics in the simulation and test field, and by Siemens' partners and product managers who provided updates on various elements of Siemens' extensive solution portfolio. The sheer number of breakout sessions was impressive and is a solid testimony to the scope of Siemens' offering, as well as their customers' satisfaction with it. With, at times, seven concurrent breakout sessions, it was impossible to hear everything, but some of the highlights follow.

In one of many sessions focused on the aerospace industry, Mr. Mark Sharples, MSc, Technical Engineer at the UK-based OnePLM, presented on the topic he entitled, "Airbus Defense & Space—Making space a universe of possibilities for everyone." He stressed how Simcenter offers companies a way to develop smart products and deliver new designs with shorter design cycles. Mr. Sharples shared a specific example on how Simcenter Femap has been used to implement automatic batch analysis, large data analysis (2x more models analyzed), and improved simulation lifecycle management to achieve double digit improvements in speed and costs. His example of an automated waveguide simulation process that has proven to reduce the time to simulate from 40 hours down to 3 hours. A great illustration of what can be accomplished when you have an integrated toolset that minimizes data transfer and provides the right level of simulation capabilities when and where needed.

Another aerospace industry specific example was presented by Dr. Simon Rees, PhD CEng FIMechE FRSA MRINA, Projects Director, from the UK-based Norton Straw Consultants. His presentation provided a well-documented example of how a major gas-turbine manufacturer moved from a combination of in-house tools and disconnected proprietary software to an

integrated Simcenter-based solution that automated the meshing and analysis process. Similar to the presentation described above; Dr. Rees commented that this work led to a 2x reduction in overall processing time. One of the biggest factors in this was their ability with Simcenter 3D to fully couple flow and thermal models so that they could be automatically generated and run from parametric geometry. He noted that some of this improvement was made possible by using the Simcenter STAR-CCM+ solution.

One additional aerospace presentation to take note of was given by Mr. Mümtaz Afşın Esi, MSc, Structural Mechanics Team Leader, from the Turkish-based Roketsan. In his presentation, Mr. Esi described how Roketsan is using various Simcenter solutions to support a modern Ground Vibration Test (GVT) approach for hammer testing and shaker testing of missile structures. Like many of the presentations given over the two days, this was filled with technical detail. Mr. Esi did an excellent job walking the audience through the work performed at Roketsan—from how different measurement setups were used to best understand the effect of the test instrument selection, to how they are examining the subsections of the test related to the effect of the excitation/support location and excitation signal/level. Finally, he commented why validating test results with analytical results is critical, and how they perform finite element analysis of a missile in free-free flight condition with MSC APEX and MSC NASTRAN software. A clear indication of the openness of Simcenter and its ability to integrate with simulation solutions from other solution providers.

Ms. Aoi Nakanome, Engineer, from Hitachi Automotive Systems' CAE Technology Development Department in Japan presented a user story entitled, "Estimation of In-Vehicle Noise of Electric Power Steering (EPS) Using Component Based Transfer Path Analysis (TPA)." With electrification's rise of importance in the automotive industry, the need to simulate related items has become critical. A side result, as described by Ms. Nakanome, is that the resulting improvement of vehicle quietness, mainly from their powertrains, is that operation noise of chassis components, like steering components, has become more apparent. She described how Hitachi is developing technology to estimate and evaluate the interior noise from bench test results for individual components. This requires them to use simulation solutions during front-end engineering, thereby reducing the cost of late changes, as well as increasing their first-time adherence to right-to-market noise targets. Ms. Nakanome's presentation was a great example of how various Siemens' solutions are being used for simulation-driven design in this rapidly expanding market.

In another automotive industry related presentation, Dr. Koen De Langhe, PhD, Product Management, from Siemens spoke on how to "Mitigate EMC/EMI Issues for Electrified Powertrain." Dr. De Langhe stressed how a comprehensive digital twin can be used to support this challenge. He also talked about how the proliferation of vehicle electronics (i.e., communication and infotainment systems, sensors, driver assistance systems, engine control units, etc.) is making cars more complex, making it more important to perform simulations. He stated, that "…the continuously increasing number of potential emitters and susceptible equipment installed in a limited space and the huge number of wires running along the chassis is posing serious electromagnetic compatibility/interference (EMC/EMI) issues…[and] more stringent EMC regulations with respect to commercial products have been released." Finally, he described how a multi-physics, multi-domain, and multi-scale approach can be used to assess potential EMI/EMC issues caused by an electronic powertrain, as well as how such an approach can be enabled by Simcenter 3D that supports the integration of several pre-processing, modeling, and post-processing tools into a seamless workflow. Overall, this was an excellent demonstration of Siemens' comprehensive solution portfolio and how it is being applied to some of today's automotive industry's rapidly evolving challenges.

Beyond automotive and aerospace, a number of presentations related to the high-tech industry, one focused on "simulation-led design for additive manufacturing." This day-two presentation by Mr. Julian Gaenz, MA, Application Manager Manufacturing, Siemens and Mr. Yves Jamers, 3D Printing EMEA GTM, HP Belgium BVBA, covered the main process by which HP redesigned and optimized a critical and complex additive printer cooling systems airduct assembly using Computational Fluid Dynamics (CFD) and topology optimization from Simcenter STAR-CCM+, as well as the use of Simcenter 3D to ensure manufacturability. This customer example illustrated how topology optimization combined with additive manufacturing can be used to significantly improve performance, while reducing manufacturing costs. According to the gentlemen, the new design improved cooling performance by increasing the mass flow rate by 22%, manufacturing costs were reduced by 10% per part, and the improved cooling performance enabled a 15% increase in printer speed. Additionally, they indicated that using topology optimization enabled an improved design to be found 75% faster. All impressive figures that show the value and capabilities of the Siemens' solution portfolio applied to address HP's challenge.

Dr. Gennady Markelov, PhD, CFD Specialist from the Netherlands-based firm Vuyk Engineering Rotterdam, spoke on a consumer products industry related topic, with a presentation entitled "Drag prediction for lattice structure wrapped with fabric." It was refreshing to hear an industrial application somewhat outside of the typical mechanically oriented industries of automotive and aerospace. Dr. Markelov described an industrial user story where permeable fabric is used for many large-scale applications, for example, commercial banners. According to Dr. Markelov, "in these case, it is important to take into account the effects of both the fabric and the solid structure behind it on the air flow properties which makes modeling very challenging." He went on to state that, "for design purposes it is required to predict drag quickly and engineering models developed for this purpose have to be validated. The validation can be done using CFD." He described in detail how he applied numerical modeling for the flow around the lattice structure wrapped with fabric using Simcenter STAR-CCM+. He also explained his two-step modeling and simulation approach: (1) find the porous media properties of a fabric with known air permeability; and then (2) compute the air flow around a solid structure taking into account the porous media regions. This technical presentation demonstrated some of the modeling and simulation complexities that were extremely difficult, if not impossible to perform only a few years ago, thereby further illustrating the ability of Siemens solution portfolio to remain state-of-the-art.

Finally, it is worth commenting on Dr. Mattias Riegel's presentation entitled "New Microphone Array at the FKFS Aeroacoustics Wind Tunnel." Dr. Riegel, Dr.-Ing., is the Team Leader for Acoustic Measurement and Analysis Technology at the Germany-based Automotive Engineering and Vehicle Engines Stuttgart (FKFS). He described his work in measuring and understanding wind noise and its impact on vehicle passenger comfort. Like a number of other presenters, he too commented on how the movement to electric powertrains is increasing the importance and need to reduce other vehicle-related noise generators. That is because the masking effect of drive train noise decreases in electrified vehicles. He stated, that "for mid to high driving speeds the wind noise strongly contributes to interior noise, in addition to the tire-road and rolling noise." To understand and analyze wind noise better, he described how a new large microphone array system was installed in the full-scale aeroacoustics wind tunnel of Stuttgart University, and operated by FKFS. Additionally, he described how this complex large microphone array "…enables the localization of exterior sound sources from the side and the top of a vehicle in parallel." The 168-channel top array, 144-channel side array, and 54-channel interior array all play critical roles in the gathering the data needed to understand the impact of

design on wind noise (e.g., how a body panel or side view mirror is shaped). Furthermore, he claimed that "the microphone array is a very efficient measurement equipment for wind tunnel testing, which offers enhanced and fast possibilities for vehicle development." He summarized by stating that the system is able to accurately localize sound sources outside, as well as inside the vehicle being tested. Lastly, he commented that this analysis wouldn't be possible without the utilization of Siemens Simcenter test solutions that gather a large amount of data and analyze it in near real time. This example clearly illustrates how Siemens' solution portfolio can be used to close the loop among design, testing, and S&A disciplines within product development.

Concluding Comments

As illustrated by the selected presentations described herein, Siemens' 2019 Simcenter conference was packed with a comprehensive set of customer, product update, and training sessions. These presentations exemplified Siemens' investment in, and multi-industry applicability of, their simulation and test solution portfolio. In many cases, Siemens' customer stories represent journeys that they have been on for some time. Some started with tools that Siemens has acquired over the years (e.g., LMS, STAR-CCM+), and others are leveraging tools and capabilities that Siemens has been advancing for many years (e.g., Femap and Simcenter 3D).

On the solution front, Siemens' focus on integrated value-driven workflows enabled by HEEDS, (Siemens' design space exploration solution that interfaces with numerous CAD and commercial CAE tools), is continuing to prove an effective way to augment human expertise in the analysis process. Additionally, the simulation data and process management capabilities of Siemens' Teamcenter solution continues to deliver required support as sought after by leading industrial companies. It is also important to mention that Simcenter FLOEFD for frontloading flow simulation and Simcenter Amesim for system simulation and the creation of comprehensive digital twins both play critical and expanding roles in the Simcenter portfolio. The coming together of Siemens' Simcenter solution portfolio has been interesting to watch, and lauded by many of the customers in attendance.

Finally, it is important to remind the reader that the synergy between Siemens' extensive test and S&A offering should not be trivialized. As the last presentation illustrated, Siemens' test solutions play a core role in Siemens' comprehensive digital twin strategy, as well as support the strategic requirement many companies have to close the often-complex product development verification and validation loop. One of the many examples Siemens offers that closes the loop between the digital and the physical worlds. Critical for a manufacturers' digital transformation.

About CIMdata

CIMdata, an independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM). CIMdata provides world-class knowledge, expertise, and best-practice methods on PLM. CIMdata also offers research, subscription services, publications, and education through international conferences. To learn more about CIMdata's services, visit our website at http://www.CIMdata.com or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 734.668.9922. Fax: +1 734.668.1957; or at Oogststraat 20, 6004 CV Weert, The Netherlands. Tel: +31 (0) 495.533.666.