ZETA

SYMPOSIUM

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review

empowering the **future!**

Using the industrial metaverse to master challenges in pharma & biotech.

The ZETA Symposium 2025 was held at the scenic Schloss Seggau in Southern Styria, Austria, attracting top industry executives from around the world. These leaders gathered to engage in forward-thinking discussions with technical experts and scientific partners. This well-established event provided a platform for around 200 participants.

The gathering centered on some of today‘s most debated topics: the use of industrial metaverse technologies to address current and future challenges in pharma and biotech. It also explored how technologies like AI, robotics, simulations, and the industrial metaverse will revolutionize these sectors.

The event kicked off with a relaxed gathering and wine tasting at the castle tavern. Over the next two days, participants enjoyed inspiring lectures from renowned industry and academic experts, debated future challenges in the Sponsor Forum and panel discussions, seized opportunities to network and learn about new technological solutions, and relished the social get-together in a pleasant atmosphere.


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conference sessions

Amidst the historic setting of Seggau Castle, the 6th ZETA Symposium commenced with a warm welcome from Andreas Marchler. The ZETA Managing Director emphasized his firm belief in teamwork, collaboration, and networking as keys to success. He highlighted the importance of competing for the best ideas and the speed of implementation, articulating ZETA's mission: "To do our best to improve the quality of life of patients and thereby make an important contribution to society."

Andreas Marchler stressed the need to develop sustainable production processes and make the entire production value stream faster and more efficient by breaking new ground. He identified artificial intelligence, simulation, and automation as key technologies to achieve the necessary innovations.

After expressing his gratitude to the sponsors, supporters, speakers, and organizers of the ZETA Symposium 2025, Andreas Marchler introduced **Oliver Spadiut**, a renowned expert in both academia and the biotech industry and Head of the Research Unit for Biochemical Engineering at TU Wien. He keenly took over the moderation of the multifaceted presentations and discussions.

Peter Llewellyn-Davies, President of BIOTECH Austria, delivered a compelling keynote lecture on current trends in the biotech industry. He emphasized the significant challenges within biotech, asserting that innovation is key to overcoming these challenges.

Llewellyn-Davies highlighted the importance of agile management in navigating biotech's life cycles and challenges. He noted that while pharma often dictates trends, the biotech business model requires constant pivoting, revising, and adjusting strategies. Despite these shifts, science and innovation ultimately drive economic success.

Balancing exploitation and exploration is crucial, he explained, as finding investors willing to take risks is essential. "The industry is always changing, we have new drugs coming on the market every day, always with new trends happening. The question is, should we follow these trends, or should we do something that is challenging the status quo?" Llewellyn-Davies distinguished true innovation from mere trends and fads, stressing that real breakthroughs require changing habits and overcoming scepticism.

He discussed the predefined cycles of the Kondratieff wave and identified healthcare as the technology of the future. With rising life expectancy and increasing costs for elderly care, biotech and pharma have significant opportunities. Personalized medicine, he predicted, will lead to 100% response rates to drugs, marking a true innovation rather than a trend.

Llewellyn-Davies outlined the lengthy process of developing new medicines, which can take 10-15 years and substantial funding. He acknowledged the „Valley of Death“ in biotech funding and urged investors to take risks for greater success. Despite growing competition and flattening R&D productivity, he encouraged staying focused, improving business models, being agile, passionate, and motivating employees.

Peter Sperk from SAP began his presentation by highlighting that biotech and pharma operations are not so different from other industries. He discussed the immense promise of AI to improve warehouse and production processes, but noted that enterprise-wide adoption of AI faces challenges, particularly due to data issues, with 95% of data being private. Change was a recurring theme, driven by macroeconomic and geopolitical dynamics, regulatory requirements, talent shortages, and internal inefficiencies. „Every CEO in every company is thinking about how they can use AI, everyone is doing small projects. But the real challenge is how do I scale it across the organization?“ Sperk emphasized.

more value from data

He highlighted four key factors in managing change: standardization issues, adoption of AI, people and their skills, and extracting more value from data. The presentation explored the industrial maintenance ecosystem, focusing on maximizing uptime and minimizing costs. Despite advances like digital twins, much work remains manual. The Asset Administration Shell (AAS) was introduced to promote interoperability, and SAP‘s cloud-based network was highlighted for connecting industry players. Real-life use cases demonstrated practical applications of these concepts.

Gerhard Kress from Siemens explored the concept of the Industrial Metaverse, questioning whether it is „hype or hope.“ He discussed how this digital realm, where collaboration spaces and digital twins interact, can revolutionize industries by creating systems that reflect reality. Kress highlighted the shift from traditional hardware to software-defined systems, using Siemens circuit breakers as an example. He emphasized the importance of digital twins in optimizing operations and driving sustainability, noting that the real challenge lies in implementation, not technology.

Kress addressed the critical issue of making data accessible: “The big question is, how can we all make more sense of data, how can we turn data into value.” He stressed the need for faster time-to-market, efficient tech transfer, and scaling up, advocating for knowledge sharing. He underlined the necessity of integrating human factors into these systems, promoting collaboration over competition between humans and technology. Kress concluded by emphasizing that technologies are tools to aid growth, but not the ultimate goal.

Jürgen Kern from ANDRITZ provided an in-depth look at their approach to digitalization on the shop floor. As a machine-building company with 90 product groups, Andritz aims for profitable growth through decarbonization, customer service, and digitalization. Kern emphasized achieving autonomous plant operation while ensuring sustainability by helping customers save energy and chemicals, as well as by extending the life of spare and wear parts.

He highlighted the Metris digitalization platform, built on five pillars: process optimization, plant management, asset optimization, cyber security, and training. ANDRITZ‘s partnerships with global tech companies have led to the development of an industrial copilot to assist industrial and maintenance teams. This copilot supports operators in root cause analysis and troubleshooting, increasing autonomous plant operation. Kern stressed that the goal is to empower operators with decision-making tools, not to reduce the workforce.

He introduced Agentic AI, which combines various AI approaches to predict, anticipate, and make goal-oriented decisions. Kern concluded by inviting attendees to the live demo at the ZETA workshop on Wednesday.

Julien Janda and Ádám Wolf from Takeda provided a realistic outlook on the application of robotics in the pharmaceutical industry. The first part of the talk was about the drivers of robotization. Janda emphasized that the implementation of robotics is business-driven, highlighting several specific value propositions, including savings, improved efficiency, and enhanced product quality. He especially emphasized EHS aspects: “I think it a very honorable job to make sure that our colleagues get home after a day of work safe and sound. Robotic can help to ensure that by removing dangerous, dirty, and dull tasks.”

Ádám Wolf gave an overview of what and why certain processes are robotized, showing different application areas across the entire value creation chain, all the way from intralogistics throughout the different steps of manufacturing, including clean room operations, to fill-and-finish operations. “Each of these areas come with specific requirements, challenges, but also potentials in terms of robotics,” Wolf explained, and gave an overview by indicating robot types and their various applications. He introduced the concept of collaborative robots (cobots) and discussed the challenges of integrating robots into grade A cleanrooms, stressing the importance of considering principles like movement and turbulence. Wolf demonstrated the use of smoke studies to visualize turbulent areas, particularly when opening vials, and showcased MoMa robotics for transportation tasks using mobile manipulators. He underlined the importance of thinking in terms of systems rather than stand-alone solutions, advocating for a holistic approach to automation. The presenters concluded by emphasizing the need to carefully plan and execute automation strategies to ensure they are effective and beneficial.

robotic can help

Frank Cordes from Boston Consulting Group delivered an insightful presentation, focusing on the future of pharma factories and the impact of generative AI (Gen.AI) on the industry. He emphasized the rapid advancements in AI technology over the past year, noting that AI has evolved from a few models to a competitive space with diverse capabilities. „2024 has been exciting, the technology has advanced at a pace that basically put a decade of advancement into 12 months,“ Cordes remarked.

The speaker highlighted the shift from experimentation to at-scale application of AI in enterprises, particularly in core processes like R&D and operations. He shared a personal anecdote about using ChatGPT to automate booking a tennis court, showcasing AI‘s practical applications. One key point was the leveling effect of Gen.AI on talent, with

experiments showing that ChatGPT can enhance performance and reduce biases in skill levels.

Frank Cordes also discussed the implications of Gen.AI on the pharma supply chain, stressing the importance of applying AI to the right tasks to avoid pitfalls. He provided examples of AI applications in yield analytics, empowering shift managers and operators with simplified recommendations. In conclusion, Cordes highlighted the transformative potential of Gen.AI in the pharma industry and the need for strategic application to maximize its benefits.

think summit

In his talk, futurist **Sven Gábor Jánszky** (2b AHEAD Think Tank GmbH) offered a scientific approach to predicting the next 5-10 years, emphasizing that he does not rely on a crystal ball but on rigorous methods. Jánszky explained that his institute conducts 500 interviews annually with industry leaders, customers, and future agents to shape their predictions. He highlighted the importance of investing in one‘s predictions, cautioning against consultants who do not put their money where their mouth is.

Jánszky introduced the concept of the „reality gap,“ illustrating the differing perspectives between European leaders, who often foresee crises, and their counterparts in the US and Asia, who are optimistic about solving major global issues. He provided examples of technological advancements, such as AI agents and quantum computing, that are poised to transform industries. Jánszky also discussed the potential for significant growth in human health and life expectancy, driven by innovations in genetics and biotechnology.

Regarding AI agents, he posed the question of where these agents are going to meet. His enlightening answer: “It is metaverse. Erase your picture that you, the human, will be playing in the metaverse. Your agents will do this.”

predictive economy

He explored the implications of a predictive economy, where data analytics and AI tools drive productivity across various business units. Jánszky envisioned a future where humanoid robots become commonplace, and adaptive products cater to individual needs. He concluded by advocating for the backcasting method to develop future strategies, urging companies to prepare for a rapidly evolving technological landscape.


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conference sessions

The Wednesday morning session highlighted the Research Center Pharmaceutical Engineering (RCPE) and its focus on digitalization, advanced formulations, and next-generation manufacturing. **Johannes Khinast**, the Scientific Director, discussed global challenges such as geopolitical issues, medicine shortages, and supply chain disruptions, emphasizing the dependence on Chinese antibiotics. He referred to AI as the „mother of progress“ and stressed that digitalization is a major business driver.

Khinast outlined RCPE‘s vision of a digital-based, high-speed development process from molecule to product, coupled with green manufacturing practices. The mission is to foster robust supply chains, accelerate medicine development, and make Europe resilient. “Continuous manufacturing is an important idea, because it makes manufacturing cheaper, as the facilities are much smaller,” he explained.

He compared batch and continuous cultures in bioprocess engineering and discussed developing digital tools for unit operations. Khinast advocated for combining AI with mechanistic models to predict flow and optimize processes. He also explored lyophilization, emphasizing the role of digital tools and AI in improving efficiency and reducing waste.

Thomas Wucherpfennig and Erik Hasenfus from Boehringer Ingelheim delivered an inspiring lecture on process modeling strategies for successful biopharmaceutical developments. Their presentation highlighted various modeling tools and techniques used to optimize biopharmaceutical manufacturing processes.

Thomas Wucherpfennig began by outlining their expertise in mammalian cell cultures for producing APIs, mainly antibodies. He discussed the goals and challenges in process development, such as improving yield, product quality, and scalability. „Data quality is important. Data readiness, facility fit, and economics are crucial aspects,“ Wucherpfennig noted.

He introduced the Process Modeling Toolbox, which includes statistical models, mechanistic models, neural nets, hybrid models, metabolic flux analysis, CFD (Computational Fluid Dynamics), and plant models. He emphasized the role of CFD in upstream equipment characterization and scale-up strategies. „We really trust in these models and they‘re really important at the end of the day," he said.

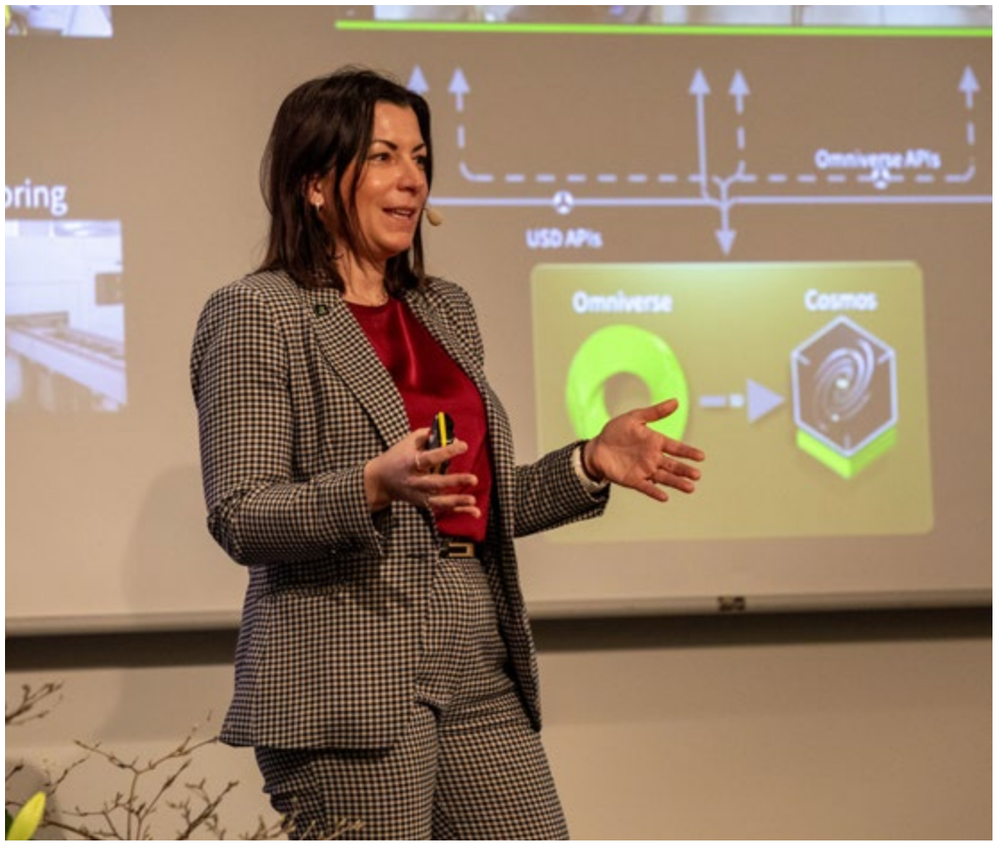
Erik Hasenfus then discussed facility modeling, emphasizing its use in capacity planning, facility fit analysis, bottleneck identification, and sustainability measures. „INOSIM is a really great tool for that matter," Hasenfus stated. He showcased a use case where plant modeling helped compare process intensification, leading to significant improvements in yield, water savings, and cost reduction.

trust in these modells

In conclusion, their lecture underlined the value of advanced modeling tools in biopharmaceutical process development, demonstrating their potential to enhance efficiency and reduce experimental efforts.

Eva-Maria Hempe from NVIDIA began her presentation by addressing the „elephant in the room"— her presence at the Symposium as a representative of NVIDIA, a company widely known in the context of video games. However, as she explained, NVIDIA also has a strong healthcare portfolio. The speaker traced the evolution of AI, from its early applications in perception AI, such as speech recognition and medical imaging, to the current focus on physical AI, which involves taking sensory input from environments like factories and converting it into actionable outputs. She emphasized the importance of physical AI in various sectors, including buildings, humanoids, and transportation.

One of the key points of the presentation was the concept of the Omniverse, a platform for building and operating physical AI. Hempe explained that the Omniverse integrates various platforms into a single source of truth for real-time collaboration, enabling digital twins of factories.



Eva-Maria Hempe also discussed the challenges and potential of developing humanoid robots. „I am super excited about humanoids," she said, but acknowledged the difficulties, noting, „It is hard to get data to teach a robot how to be a good robot." She highlighted the need for virtual worlds to train robots safely and efficiently, using the Omniverse to create physically accurate simulations.

how to be a good robot

In conclusion, Hempe's lecture emphasized the exponential growth potential of physical AI and its applications in various industries. She encouraged attendees to start developing on the Omniverse, either through a DIY approach or with a partner, reminding them that while progress may seem slow initially, the long-term benefits are substantial.

Martin Prinz, founder and Managing Director of coac GmbH, delivered an insightful presentation on AI-powered innovations in the pharmaceutical industry. He discussed the importance of AI in improving efficiency and addressing challenges such as rising production costs, skilled labor shortages, and supply chain pressures.

Prinz highlighted AI's role in creating transparency and bridging data silos within the process industry. He explained how AI can collect, harmonize, and contextualize data from various sources, including technical drawings, SAP systems, and external inspection data. „We use AI models to generate data quality," he noted, emphasizing the importance of high-quality data for effective AI utilization.

A key point was the transformation of technical drawings into structured data using AI. Prinz described how his company trained AI models to recognize equipment types, physical measures, and connection lines in technical drawings, achieving a precision of 97%. He also discussed creating digital identities for equipment and materials, which can be tracked throughout their lifecycle. Prinz emphasized AI's potential to enable sustainable transformation and efficiency gains, urging the industry to consider quantum technology as a future gamechanger.

Andrew Clutterbuck from Merck delivered an insightful presentation at the ZETA Symposium 2025, focusing on the integration of continuous manufacturing and digitalization in biomanufacturing. He clarified the distinction between the German Merck and the American Merck, emphasizing Merck's long-standing heritage and global presence.

The speaker highlighted the shift from traditional batch processes to more continuous and intensified processes in biomanufacturing. He discussed the challenges and benefits of this shift, noting that „biology is messy" and variability in processes must be managed within a narrow operational window. He explained the importance of process analytical technology (PAT), including Raman spectroscopy and automated sampling solutions, to monitor and control processes in real-time.

He also described the advantages of single-use systems and operational flexibility in manufacturing, showcasing a visual representation of a single-use process. Clutterbuck emphasized the role of collaborations

with customers and suppliers in advancing continuous manufacturing and overcoming regulatory concerns.

In conclusion, Andrew Clutterbuck underlined the potential of continuous manufacturing and digitalization to enhance efficiency, reduce costs, and improve product quality in biomanufacturing. He expressed confidence in the industry‘s direction, stating, „I‘m confident that the future‘s looking bright.“

Steffen Schulze from Roche concluded the conference sessions at Schloss Seggau with an engaging presentation on continuous manufacturing, promising to take the audience “to the wonderland of ATMPs (advanced therapy medicinal products).” He focused on the unique manufacturing challenges in this rapidly evolving field, highlighting how diverse technologies and non-traditional scaling processes drive up costs and complicate market entry. Schulze emphasized the importance of integrating chemistry, manufacturing, and controls (CMC) considerations early in development to streamline processes and mitigate these issues.

manufacturing challenges

He discussed major cost drivers, such as the high technology diversity of portfolios and the lack of standardized methods, which increase development costs and complexity. Schulze proposed adopting platform-based strategies to address these challenges, illustrating his points with real-world case studies. He explained how these insights can improve manufacturing practices and enhance patient access to ATMPs.

Schulze also highlighted the benefits of vertical integration in manufacturing, particularly for plasmids and nucleases, which can reduce costs, improve quality, and accelerate production timelines. In conclusion, he underscored the need for early-stage strategies to improve decision-making, optimize manufacturing networks, and enhance access to ATMPs, delivering tangible benefits to patients worldwide.

sponsor forum & panel discussion

The Tuesday morning **Sponsor Forum** featured lively discussions with enthusiastic participation from attendees. Each selected business partner – **Siemens, GEMÜ, Endress+Hauser, Mettler Toledo, Dockweiler, and Turck** – invited the audience to their tables to engage in conversations on carefully chosen and highly relevant topics.

A heartfelt thank you to our amazing sponsors for making the event such a success!

Another highlight of the ZETA Symposium 2025 was the **Panel Discussion** on Tuesday. Invited speakers and industry experts **Frank Cordes (Boston Consulting Group), Eva-Maria Hempe (NVIDIA), Julien Janda (TAKEDA), Peer Sander (INOSIM), and Thomas Wucherpfennig (Boehringer Ingelheim)** engaged in a dynamic discussion on the current state and future trends of simulation in (bio)process development and operations.

workshops at the ZETA headquarters

Following the conference, many participants joined **the workshops** and engaged in face-to-face exchanges with experts at **ZETA headquarters** in Lieboch, Austria. These workshops offered insights into some of the most fascinating technological advancements. Participants were able to closely experience a future-proof **Buffer Inline Conditioning System** and the **EcoConnect** aseptic connection solution.

Additionally, they learned more about the hot topics driving ZETA's customers, including **INOSIM simulations** to handle batch plants, **process-based cleanroom design**, **VR training tools** and were shown some hands-on examples for **AI on the shopfloor**.

conclusion

In conclusion, the 2025 ZETA Symposium was a resounding success. Participants valued the opportunities the event provided to bring together experts and potential business partners, facilitating knowledge sharing and discussions on future cooperation.

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