Exponent®
Engineering & Scientific Consulting


# Achim Wechsung, Ph.D., P.E., CFEI

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## Professional Profile

Dr. Wechsung is a chemical engineer in Exponent's Thermal Sciences practice consulting primarily in the areas of hydrogen, petrochemical, chemical and industrial processing, oil and gas, process safety, risk analysis, fire and explosions, and advanced modeling. He has investigated incidents at petroleum refineries, chemical, industrial and waste processing plants and storage facilities as well as fires and explosions at residential and industrial sites.

Dr. Wechsung has supported clients in international arbitrations concerning the design, engineering, construction, and commissioning of chemical plants and power generation systems. He also applies his expertise to challenges clients face in the energy transition including the production, storage, and transportation of blue and green hydrogen.

Dr. Wechsung is experienced in modeling, simulating, and optimizing industrial processes and process networks. He leverages his understanding of multi-component thermodynamics, fluid dynamics and reactive systems to analyze process scale-up, upsets, loss of containment, runaway reactions, and product releases from process systems and product storage. He is skillful in using commercial chemical process simulators such as Aspen Plus© and interpreting process historian data.

Dr. Wechsung has evaluated infringement and validity of patents and trade secrets for petroleum technologies. He has performed dust hazard analyses (DHA) for manufacturers handling combustible organic and metal dusts, hazard identification (HAZID) workshops and process hazard analyses (PHA) such as HAZOPs.

Dr. Wechsung has held key roles in multiple industrial process development projects, including methane pyrolysis for sustainable hydrogen production with a reduced carbon footprint, and has conducted thorough risk assessments. He has successfully supported pilot plant operations for process scale-up and has worked closely with major multinational engineering companies to bring new technologies to the market. Additionally, he has advised senior management on the impact and mitigation of incidents affecting chemical production sites. He understands the value contained in industrial data sets and is experienced in analyzing these with state-of-the-art methods to draw actionable conclusions.

Prior to joining Exponent, Dr. Wechsung worked in multiple roles for BASF, one of the world's largest chemical companies. At BASF he developed new chemical processes, led research project teams, advanced digital capabilities, and supported the world's largest integrated chemical complex in Ludwigshafen, Germany, a site with more than one hundred plants. Previously, he conducted his Ph.D. research at Massachusetts Institute of Technology (MIT) in the Department of Chemical Engineering. His research focused on developing cutting-edge numerical methods for optimization of nonlinear models and their application in case studies taken from liquefied natural gas (LNG) processing and coal combustion.

 

## Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, Massachusetts Institute of Technology (MIT), 2014

Dipl.-Ing., Mechanical Engineering, RWTH Aachen University, Germany, 2008

## Licenses and Certifications

Professional Engineer Chemical, California, #7005

Professional Engineer Chemical, New Jersey, #24GE06249300

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER)

Certified Fire and Explosion Investigator (CFEI)

## Prior Experience

BASF SE, 2013-2019

## Professional Affiliations

American Institute of Chemical Engineers (Senior Member, AIChE)

National Association of Fire Investigators (NAFI)

National Fire Protection Association (NFPA)

- Principal Member of the Committee on Hydrogen Technology responsible for NFPA 2 Hydrogen Technologies Code

- Alternate Member of the Committee on Classification and Properties of Hazardous Chemical Data responsible for NFPA 704 Standard System for the Identification of the Hazards of Materials for Emergency Response

International Council on Large Electric Systems (CIGRE)

- Member of Joint Working Group C5/C1.35 Integration of hydrogen in electricity markets and sector regulation

CSA Group

- Member of the Fuel Cell Technical Committee

- Member of the Hydrogen Generators – Fuel Processing Technical Subcommittee

- Member of the Stationary Fuel Cell Power Systems Technical Subcommittee

Verein deutscher Ingenieure (VDI)

## Languages

German

## Patents

Appel H, Bernnat J, Glenk F, Kolios G, Olbert G, Scheiff F, Zoels B, Kern M, Flick D, Anderlohr CA, Klingler D, Wechsung A. Solids-packed apparatus for performance of endothermic reactions with direct electrical heating. US11,882,629.

Kolios G, Zoels B, Kern M, Bernnat J, Koenig R, Glenk F, Wechsung A. Method and device for carrying out endothermic gas phase-solid or gas-solid reactions. US11,691,115.

Zander HJ, Weikl M, Bode A, Klingler D, Kern K, Kolios G, Wechsung A, Scheiff F, Flick D, Antweiler N, Büker K. Reactor for high temperature endothermic reactions. EP 3,947,261.

Appel H, Bernnat J, Glenk F, Kolios G, Olbert G, Scheiff F, Zoels B, Kern M, Flick D, Anderlohr CA, Klingler D, Wechsung A. Device packed with solid matter for conducting endothermic reactions with direct electric heating. EP 3,744,154.

## Publications

Wechsung A, Orella MJ, Kersey KD, Myers, TJ. The energy transition — how will it impact fire investigation. Proceedings, ISFI, Orlando, FL, 2024.

Wechsung A, Barry MT, Dimitrakopoulos G, Spray RL, Colella F, Myers, TJ. Lithium-ion battery fire investigation fundamentals. Proceedings, ISFI, Orlando, FL, 2024.

Kytömaa H, Wechsung A, Dimitrakopoulos G, Cook N, Jaimes D, Hur I, Faraji S. Industry R&D needs in hydrogen safety. Applications in Energy and Combustion Science 18 (2024) 100271.

Wechsung A, Yen M, Ibarreta AF, Myers TJ, Kytomaa HK. Venting of Hydrogen Explosions. Proceedings, AIChE Spring Meeting & 19th Global Congress on Process Safety, Houston, TX, 2023.

Wechsung A, Wikramanayake E, Banning M, Stern M, Buehler C, Long R, Kytomaa H. Hydrogen Fire Safety: An Old Acquaintance in New Roles. Fire Protection Engineering, 2022; 94:16-20.

Wechsung A, Buehler CS, James JN, Morrison AM, Stern MC. Carbonomics: introduction to carbon pricing, regulations, and frameworks. Chemical Engineering Progress, 2022, September:23-29.

Stern MC, Orella MJ, Wechsung A, Buehler CS. Carbon capture vs lithium ion batteries – which pairs better with renewable electricity? Proceedings, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Stern MC, James JN, Morrison AM, Wechsung A, Buehler CS. Carbonomics: introduction to carbon pricing, regulations, and frameworks. Proceedings, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Stern MC, James J, Morrison AM, Wechsung A, Buehler CS. Life cycle assessments: corporate value or potential risk lies in the details. Proceedings, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Wechsung A, Buehler CS. What did I actually buy—guarantees of origin for hydrogen. Proceedings, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Wechsung A, Watson HAJ, Scott JK, Barton PI. Reverse propagation of McCormick relaxations. Journal of Global Optimization, 2015; 63: 1-36.

Stuber MD, Wechsung A, Sundaramoorthy A, Barton PI. Worst-case design of subsea production facilities using semi-infinite programming. AIChE Journal, 2014; 60:2413-2524.

Wechsung A, Barton PI. Global optimization of bounded factorable functions with discontinuities. Journal of Global Optimization, 2014; 58: 1-30.

Wechsung A, Schaber SD, Barton PI. The cluster problem revisited. Journal of Global Optimization, 2013; 58: 429-438.

Wechsung A, Aspelund A, Gundersen T, Barton PI. Synthesis of heat exchanger networks at subambient conditions with compression and expansion of process streams. AIChE Journal, 2011; 57: 2090-2108.

Wechsung A, Oldenburg J, Yu J, Polt A. Supporting chemical process design under uncertainty. Brazilian Journal of Chemical Engineering, 2010; 27: 451-460.

**Presentations**

Wechsung A, Orella MJ, Kersey KD, Myers, TJ. The energy transition — how will it impact fire investigation. Oral presentation, ISFI, Orlando, FL, 2024.

Wechsung A, Barry MT, Dimitrakopoulos G, Spray RL, Colella F, Myers, TJ. Lithium-ion battery fire investigation fundamentals. Oral presentation, ISFI, Orlando, FL, 2024.

Kytömaa H, Wechsung A, Dimitrakopoulos G, Cook N, Jaimes D, Hur I, Faraji S. Industry R&D needs in hydrogen safety. Industry R&D Needs in Hydrogen Safety. Industry Invited Perspective. Combustion Institute's 40th International Symposium, Milan, Italy, 2024.

Wechsung A, Hart RJ, Morrison, DR, All Aboard: Hydrogen on Rail. Oral presentation, 2024 Center for Hydrogen Safety Americas Conference, Las Vegas, NV, 2024.

Wechsung A, Reding N, Ibarreta AF, Myers TJ. Navigating Unfamiliar Territory: US Hydrogen Safety Regulations and European Standards. Oral presentation, 2023 Center for Hydrogen Safety Europe Conference, Rotterdam, Netherlands, 2023.

Wechsung A, Yen M, Ibarreta AF, Myers TJ, Kytomaa HK. Venting of Hydrogen Explosions. Poster presentation, AIChE Spring Meeting & 19th Global Congress on Process Safety, Houston, TX, 2023.

Stern MC, Orella MJ, Wechsung A, Buehler CS. Carbon capture vs lithium ion batteries – which pairs better with renewable electricity? Oral presentation, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Stern MC, James J, Morrison AM, Wechsung A, Buehler CS. Carbonomics: introduction to carbon pricing, regulations, and frameworks. Oral presentation, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Stern MC, James J, Morrison AM, Wechsung A, Buehler CS. Life cycle assessments: corporate value or potential risk lies in the details. Oral presentation, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

Wechsung A, Buehler CS. What did i actually buy—guarantees of origin for hydrogen. Oral presentation, AIChE Spring Meeting & 18th Global Congress on Process Safety, San Antonio, TX, 2022.

White CC, Streifel BC, Wechsung A, Myers TJ. Understanding the pathways for residual PFAS during fluoropolymer processing. Oral presentation, ACS Spring Meeting, San Diego, CA, 2022.

Wechsung A, Orella MJ, Stern MC, Kytomaa HK, Green hydrogen – removing hurdles and creating the right incentives to make it viable. Oral presentation, AIChE Annual Meeting, 2021.

Orella MJ, Wechsung A, Stern MC, Kytomaa HK, An electrofuel revolution: how direct carbon reduction can electrify the future. Oral presentation, AIChE Annual Meeting, 2021.

Sulmonetti TP, Buehler CS, Wechsung A, Dee SJ. Transitioning from one explosive fuel to the next - safety considerations in the emerging hydrogen economy. Poster presentation, AIChE Spring Meeting & 17th Global Congress on Process Safety, 2021.

Watson HAJ, Wechsung A. Use of nonsmooth models and generalized derivatives to improve the robustness of process simulations. Oral presentation, AIChE Spring Meeting & 16th Global Congress on Process Safety, 2020.

Bode A, Castro-Arce J, Heid B, Henschel C, Wechsung A, Wojcicka J. Process Technology Licensing: An Interface of Engineering and Business. Oral presentation, 12th International Symposium on Process Systems Engineering and 25th European Symposium on Computer Aided Process Engineering, Copenhagen, Denmark, 2015.

Wechsung A, Kellenbenz J, Klingler D, Bode A. R&D at BASF: Developing a more sustainable route to hydrogen and syngas. Invited oral presentation, AVT Kolloqium, Aachen, Germany, 2014.

Wechsung A, Barton PI. On-line modeling of NOx formation in a coal boiler. Poster presentation, European Symposium on Computer Aided Process Engineering, Lappeenranta, Finland, 2013.

Wechsung A, Barton PI. Improving relaxations of implicit functions. Oral presentation. International Symposium on Mathematical Programming, Berlin, Germany, 2012.

Wechsung A, Barton PI. Convex, continuous relaxations of discontinuous factorable functions. Oral presentation, INFORMS Annual Meeting, Charlotte, NC, 2011.

Wechsung A, Barton PI. Design of a self-supporting natural gas liquefaction process for accessing stranded off-shore resources. Oral presentation. AIChE Annual Meeting, Minneapolis, MN, 2011.

Wechsung A, Barton PI. Relaxations of bounded factorable functions with discontinuities. Oral presentation. 2nd World Congress on Global Optimization, Chania, Greece, 2011.

Wechsung A, Barton PI. Global optimization of discontinuous functions. Oral presentation. AIChE Annual Meeting, Salt Lake City, UT, 2010.

Wechsung A, Oldenburg J, Yu J, Polt A. Supporting chemical process design under uncertainty. Poster presentation. 10th International Symposium on Process Systems Engineering, Salvador, Brazil, 2009.