

IRC 
RUBBERCON
2024

**Advanced
Tyre Technology**

03rd – 04th DEC 2024
LE MERIDIEN, KOCHI, KERALA

Dr. Annette Lechtenböhmer

Dr. James F. Cuttino

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Dr. James F. Cuttino

Dr. Cuttino is the Director of Advanced Engineering and Testing at Yokohama Corporation of North America. In this capacity, he oversees the development of advanced capabilities, tools, and testing techniques to support tire development. Before joining Yokohama, Dr. Cuttino was the Director of Tire Technologies and Product Line at LINK Engineering. There, he was responsible for conceptualizing and developing new tire testing equipment and handling business development related to tires and tire testing services.

Dr. Cuttino's academic journey is a testament to his dedication and expertise. He earned his BS and MS degrees from Clemson University in 1985 and 1987, respectively, and began his career at Michelin America Research and Development Center. His pursuit of a Ph.D. in Precision Engineering at NC State University further solidified his knowledge. Over the next 14 years, he shared his wealth of knowledge by teaching Mechanical Engineering at The University of Alabama and the University of North Carolina at Charlotte, where he founded the North Carolina Motorsports and Automotive Research Center. In 2009, Dr. Cuttino's commitment to excellence led him to start Camber Ridge, LLC, a state-of-the-art facility designed to enhance accuracy and fidelity in tire testing. His academic background and practical experience make him a trusted authority in the field.

Dr. Cuttino has been an active contributor to numerous professional organizations, a testament to his industry recognition, he served as the Secretary and Vice President of the Tire Society, chaired the SAE Truck and Bus Tire Committee, and participated in various SAE committees and the Clemson Tire Conference committee. He delivered the keynote address at the 2017 American Society for Precision Engineering Annual Meeting and received an SAE Best Paper Award at the 2013 SAE Commercial Vehicle Conference. Dr. Cuttino holds nine patents.

- Dr. Cuttino will provide information on the mechanics of the tyre. This topic includes a physical understanding of various tire performance measures, including rolling resistance, cornering mechanics, pneumatic trail, relaxation length, cornering forces, aligning movement, cornering, braking mechanics, the friction circle, ply steer, conicity, and footprint analysis.
- Dr. Cuttino will then apply his understanding of the tire parameters to understand the resulting vehicle performance. In this session, he will provide an overview of vehicle dynamics, including weight transfer, understeer gradient, cornering performance, and tools for the tyre engineer to modify the tyre to optimize vehicle performance.
- Finally, Dr. Cuttino will discuss tire testing and its importance in tire development. Topics will include dimensional analyses, tire stiffness, and measurement of tire properties such as rolling resistance, tire wear, durability, force and movement, noise, and cleat testing.



Dr. Annette Lechtenböhmer

Dr. Lechtenböhmer is a citizen of Germany and finished her studies of chemistry at Westfälische Wilhelms-University Münster, Germany, with a PhD in Physical Chemistry in 1981. After two post-doctorates, she was employed at the Goodyear Innovation Center in Luxemburg till recently. During her career, she filled positions within compounding and compound testing, achieving the position of Senior Research Associate. During her 35 years of experience in the rubber industry, she accumulated profound knowledge of compound development, compound testing and test principles, viscoelasticity, compound processing, testing for material modeling and structure of tires, quality control, and production. Her positions required close cooperation with other steps of tire development, production, tire design, construction, raw material suppliers, and scientific institutes and Universities. She holds several Patents and Trade Secrets

In addition to her industry experience, she was a lecturer at the University, Hannover on “Tire Technology” for many years; she lectured on “Elastomer Technology at Luxemburg University” and participated as a member of the Transport Advisory Board for Framework 7, a program of the European Commission. She is a member of the Tire Society, German Chemical Society, and German Rubber Society. She retired from Goodyear in 2020 but maintained her dedication to promoting rubber and tire science. She continues teaching and serving as an Associate Editor and Secretary of the Tire Science and Technology Journal. In June 2022, she received the Badge of Honor from the German Rubber Society for her special research, technology, and economic performances.

- Dr. Lechtenböhmer will provide an overview of the different materials used in tyre construction, elaborating on the relationships of compounds and various tire properties including traction, rolling resistance and wear. She will describe the role of polymers, fillers, additives, and rubber chemicals and their influence on compound performance properties. She will then tie this back into an understanding of how the various rubber compounds used in the different tyre components influence the performance properties of tyres.
- In addition to these topics, Dr. Lechtenböhmer will discuss the impact of compounding on the “Magic Triangle”, the origin and use of the WLF equation, viscoelastic properties, and compound fracture mechanics. Finally, she will wrap up her session with a discussion of environmental aspects of raw materials and compounds.

Schedule for Tyre Properties Workshop		
3rd December 2024		
Time	Title of the subject	Speaker
08.30 to 09.00	Inauguration	J. Cuttino
09.00 to 10.30	Tire Components and Functions	A. Lechtenböhmer
10.30 to 10.45	Coffee Time	
10.45 to 12.15	Tire Compounds - Chemistry	A. Lechtenböhmer
12.15 to 13.00	Lunch Time	
13.00 to 14.30	Tire Compounds - Material Properties (Part I)	A. Lechtenböhmer
14.30 to 16.00	Coffee Time	
16.00 to 17.30	Tire Compounds - Material Properties (Part II)	A. Lechtenböhmer
19.00 to 21.00	Dinner	
4th December 2024		
09.00 to 10.30	Mechanics of Tire Performance	J. Cuttino
10.30 to 10.45	Coffee Time	
10.45 to 12.15	Understanding Performance Curves	J. Cuttino
12.15 to 13.00	Lunch Time	
13.00 to 14.30	Tire / Vehicle Interaction	J. Cuttino
14.30 to 14.45	Coffee Time	
14.45 to 16.15	Tire Testing Methods	J. Cuttino
16.15 to 16.30	Coffee Time	
16.30 to 18.00	Overview of Tire Models and Simulation	J. Cuttino

The program is designed to provide an in-depth understanding of tire technology and help the participants gain adequate knowledge to deal with day-to-day problems and build the capability to resolve such issues. The speakers will cover the following subjects during the course of teaching:

- Rubber Properties and their influence on rolling resistance, traction, and mileage
- Explanation of WLF equation
- Mechanism involved in rubber road interaction
- Different types of traction and friction mechanisms and their importance in handling behavior
- Compounding principles for designing compounds for different applications
- Tyre design and construction and its contribution to tyre properties
- Viscoelastic properties of compounds and energy dissipation
- Enlargement of the magic triangle
- Influence of compounds on different types of tyre grip
- Vehicle operating parameters and their impact on tyre properties
- Environmental factors and their impact on tyre properties
- Fundamental understanding of rolling resistance, traction and wear
- Fracture properties of compounds and their impact on tyre properties
- Testing and evaluation of all tyre properties of tyres
- Impact of grip and handling behavior
- Grip of rubber on different surfaces and how to improve