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CONFERENCE PROGRAMME

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CONFERENCE PROGRAMME

DAY 1 *TUESDAY 16 FEBRUARY* SESSION 1

09:00 - **Welcome**
Tony Robinson, Founder, Tire Technology Expo, UK

THE ROBERT WILLIAM THOMSON LECTURE

09:10 - **Silica/rubber masterbatch produced with continuous liquid phase mixing – a review of the history and future of mixing**
Meng-Jiao Wang, EVE Institute, CHINA
The presentation will offer a review of the history and future of mixing. Dr Wang will present a brief history of mixing technology, culminating in the latest development at EVE Rubber Institute in Qingdao, China. This involves solution-phase mixing in which solution-polymerised rubbers, such as S-SBR, BR and IR, are mixed in the liquid phase with silica. Mixing in the solution phase – given the right process conditions – delivers perfect dispersion of silica as well as higher polymer-filler interaction and lower filler-filler interaction, compared with conventional mixing. This process produces a masterbatch that can be used to create compounds that further expand the wear–wet-grip–fuel economy triangle. The radical new technique is another liquid phase mixing in addition to the CEC process for producing NR/carbon black masterbatch with aqueous mixing developed by Cabot.

09:40 - 10:40 - KEYNOTES

09:40 - **Keynote - Future individual mobility – consequences for tire technology**
Christian Kötz, executive vice president, Continental AG, GERMANY
Building on Continental's internal models of future mobility in the coming 20 years, the company's Tire Division has generated different scenarios for the future of individual mobility, and tried to project what those scenarios might mean for future demands on tire technology. The company promises 'interesting results' and offers them to the industry as food for thought, with the strong suggestion that technical demands will continue to expand at a rapid pace.

10:10 - **Keynote - The next game-changing innovation in tyre technology**
Koji Takagi, managing director, Bridgestone TCE

10:40 - 11:00 - Break

11:00 - 13:00 TECHNO-ECONOMIC FUTURES

11:00 - **Trends in reinforcing fillers (carbon black and silica)**
Paul Ita, president, Notch Consulting, USA
Overview of current use and future prospects for carbon black and silica in tire markets, particularly focusing on the battle for market share in passenger car and truck tires.

11:30 - **The changing face of the global tire market**
Robert Simmons, head of rubber and tyre research, LMC International, UK
During the last decade the axis of the global tire industry changed towards the emerging markets: vehicle sales increased in these markets and trade increased from the low-cost (emerging) markets to the high-cost (mature) markets. However, this is changing: macro-economic growth has slowed in the emerging markets and import duties are increasingly being used to protect local tire production. The presentation will compare trends in mature and emerging market tire demand, both for OE and replacement tire sales, and examine the effect of US import duties on Chinese tires on the global tire market.

12:00 - **European tire distribution trends**
Rutger Veerman, managing director, Vimexa Automotive BV, NETHERLANDS
Overview of the actual European tire market: market introduction; key players, distributors and retail organisations in Europe; supply and distribution trends; pricing and transparency of B2B/B2C internet portals; imports from Asia (budget tires); the market in 2025.

12:30 - **Indian tire industry – opportunities and challenges of radialisation**
Rabindra Mukhopadhyay, director (R&D), JK Tyre & Industries Ltd, INDIA
Over the next decade, the global demand for automobiles including tires will be driven by BRICS countries, accounting for over 60% of global vehicle production. The Indian tire industry, backed by overall economic development and growth potential, has bright prospects. Radialisation in the commercial segment is expected to double by 2019-2020 from the current level of 30%. The opportunity and challenges posed by recent development in the Indian automobile industry will be discussed with special reference to radialisation of the commercial vehicle segment including factors affecting the rate of change. The preparedness of the Indian tire industry to respond to the global situation will also be discussed.

13:00 - 14:00 - Lunch

14:00 - 17:00 AUTOMOTIVE SESSION AND PANEL

14:00 - **FCA vehicle dynamics evaluation of standard and innovative tires**
Claudio Ricci, engineering specialist, FCA - PD EMEA, ITALY
Mauro Martino, engineer specialist, FCA - PD EMEA, ITALY
Forecasting the upcoming emission regulations, effective at the end of the decade, a new tradeoff for the tire is expected. Nowadays, handling behaviour is a very important aspect of cars, which must reach high levels of lateral acceleration ensuring good stability and controllability. Furthermore, the latest technologies imply a good behaviour of the base car, considering active systems too (a new tradeoff is needed). Here the actual FCA's EMEA methods to evaluate the vehicle dynamics implications of the tires are summarised. Also, a first glance at the results obtained with new-generation tires is reported.

14:30 - **The role of tire and wheel simulation within chassis development regarding fuel consumption**
Guenter Leister, Daimler, GERMANY

15:00 - **Virtual testing for tire design synthesis – a vehicle dynamics perspective**
Mohammad Behroozi, senior vehicle dynamicist, General Motors, USA
The tire is the element in a vehicle that imposes an inconceivable impact on vehicle ride and handling performance. Tire models for vehicle dynamics simulation is generally carried over from the previous programme, and its performance is usually assessed during the final tuning stage. Here, the importance of developing reduced order FE-like tire models with integrated physical representation is investigated at the early stages of a vehicle development programme, prior to construction of the first physical iteration. This concept introduces a virtual prototyping and simulation environment that enables OEMs and tire manufacturers to reduce development time, costs and manpower.

15:30 - 15:50 - Break

Panel Discussion

DAY 1 *TUESDAY 16 FEBRUARY* SESSION 2

11:00 - 17:00
TIRE PRODUCTION – FUTURE VISIONS

11:00 - **Application of S-SBR/BR/silica masterbatch produced in the solution phase to PCR tread compounds**
Meng-Jiao Wang, EVE Institute, CHINA
Creating a perfect dispersion of silica in a solution of S-SBR/BR and better filler-polymer interaction require deep understanding of the fluid dynamics of turbulent flow, physics and chemistry of silica and of polymers. Balancing these different disciplines has resulted in a technological breakthrough that promises to deliver compounds that offer improved wear performance at the same time as better fuel economy and improved wet grip. Dr Wang will present the key developments in a research project that has successfully brought these disciplines together into a commercial reality.

11:25 - **Visions of the future – further deliberations on future tire production**
Jacob Peled, executive chairman, Pelmar Engineering Ltd, ISRAEL
In the last decade we have seen some major changes and developments in concepts, equipment, materials, construction and general production techniques in the tire and rubber industry. This is after more than 100 years of hardly any major changes, except perhaps radial construction and tubeless tires. We are seeing and will observe changes that relate to the entire process of production; a strong tendency towards smaller, dedicated and specialised plants; and more significant outsourcing. The presentation will touch on these various aspect and considerations for green or brownfield tire production facilities. The issue of mergers and acquisitions will be referred to as well.

11:50 - **Tire performance regulations from the perspective of a global tire manufacturer**
Martin Görlich, project manager, Giti Tire R&D Centre (Europe) GmbH, GERMANY
Giti Tire is a Singapore-headquartered tire company with eight manufacturing facilities and distribution to a market of more than 130 countries. Many countries throughout the world have established their own regulations concerning tires with different performance requirements, test conditions and regulatory markings. Thus, global tire manufacturers have to produce almost identical products but with market-specific variations to meet local market requirements. This creates significant opportunities for manufacturers to deliver better and more cost-efficient products, but also requires additional work to avoid increasing manufacturing costs.

12:15 - **Virtual tire manufacturing plants: the future is now**
Gert Nomden, senior consultant/Tecnomatix product manager, Cards PLM Solutions BV, NETHERLANDS
The characteristics of tire manufacturing processes lend themselves to the application of virtual simulation technologies par excellence. Most surprisingly, their application in tire manufacturing is nearly absent. This paper assesses the current state of what is also called the Digital Factory, and how it is applicable to tire manufacturing. Virtual simulation models of tire manufacturing plants can be used as a valuable, cost-efficient and risk-free testbed throughout the entire plant lifecycle. Simulating proposed changes – from completely new production lines, detailed engineering and commissioning, up to daily planning – has proved to reduce investments, cycle times and energy consumption.

12:40 - **Connected enterprise for next plant performance level**
Paolo Butti, automotive & tire industry manager Europe, Middle East and Africa Region, Rockwell Automation, ITALY
Tire industry new era: connected tire in a connected plant, where OT (operations technology) and IT rapidly converge to face next-generation challenges. A new environment in which all manufacturing data (Big Data) is accessible in real time, anywhere, even on mobile devices (mobility), in the appropriate format, empowering smart critical decisions to meet market demands. A realistic scenario for new facilities as well as for existing plants, where migration plans preserve and increase investments already in place, ensuring lower total cost of ownership in a zero-risk environment.

13:05 - 14:00 - Lunch

14:00 - **Sensor intelligence for Industrie 4.0 smart tire manufacturing**
Andreas Hoell, technical industry manager, Sick AG, GERMANY

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The German Industrie 4.0 initiative describes the main future development tasks for the smart factory. Core elements are vertical and horizontal communication integration, from sensor/actuator level on the shop floor up to company level and across companies. An additional core element will be the future development of human and machine in dialogue, to achieve a flexible and safe working environment. In this session we will discuss solutions for smart tire manufacturing, supported by intelligent sensors, following the manufacturing challenges on the shop floor for safety, track and trace, quality control and flexible automation.

14:25 - **Virtual commissioning connects the virtual with the real world**
Heiko Soehner, technical account manager, Siemens AG, GERMANY
Virtual commissioning shortens the time to market of machine design and production and offers new ways of maintenance. In parallel to mechanical design of the machine, functionality of the mechanics and correctness of application software for the automation controller can be tested with Mechatronics Concept Designer (MCD). Automation and numerical controller with the application software exchanges control commands and signals with the virtual machine modelled in MCD. The virtual commissioning of the application software with the virtual machine during the machine construction phase significantly shortens the time to market as well as the on-site commissioning time. Additionally, this approach improves the application software quality.

14:50 - **Tire manufacturing: an efficient approach on utilities**
Stefano Villa, oil & gas proposal manager and business development manager Europe, Middle East and Africa Region, Rockwell Automation, ITALY
Connected Enterprise allows plant efficiency increase, ensures optimal reliability, reduces risks, meets safety requirement compliance, increases uptime and minimises operational cost, which represent daily challenges in tire production plants. A plant-wide approach helps respond to all those challenges. Single platform technology able to manage production lines and utilities, and perfect and complete integration within the IT systems, can improve decision making and plant operation management, and become a great differentiator in performance improvement on either new or existing plants. Superior performance level with full control, combined with predictive maintenance, in a zero downtime environment.

15:15 - 15:35 - Break

15:35 - **Energy efficiency and LCC in tire plant production**
Björn Prinz, manager sales development GTAP, SMC Pneumatik GmbH, GERMANY
Attendees will be shown that smart investment in new machines will pay off quickly, taking lifecycle cost into consideration. The performance of a machine depends very strongly on the components that are integrated. For this reason, the components should be harmonised in correlation, which is often not the case. SMC will support customers in reducing TCO and increasing productivity – which are not in general contradictory.

16:00 - **Maximising manufacturing efficiency in the tire industry through process management**
Thomas Antony, chief executive officer, Laugfs Corporation (Rubber) Lt, SRI LANKA
A 'process approach' is becoming most innovative method to achieve business excellence. Process management involves planning and monitoring the performance of the process through application of knowledge, skill, tools, technique and systems to define, visualise, measure, control, report and improve processes to meet customer requirements for profitability. Manufacturing process management in any industry has to target the following concepts: stabilise, optimise and improve. This should be four-step process: process stability, process optimisation, process improvement and process maturity.

16:25 - **Highest transparency with Siemens Tire Production Control Center**
Gerd Hock, senior sales manager for tire industry, Siemens AG, GERMANY

DAY 1 *TUESDAY 16 FEBRUARY* SESSION 3

11:00 - 17:00 INSIGHTS INTO TIRE SCIENCE

11:00 - **Innovative molecular simulation and analysis technology for designing tire materials**
Masato Naito, assistant manager, Sumitomo Rubber Industries Ltd, JAPAN
Sumitomo Rubber Industries Ltd has developed a new materials development technology: ADVANCED 4D NANO DESIGN. It makes use of the advanced technologies of the "K computer" and other cutting-edge equipment such as SPring-8, J-PARC in Japan, enabling the analysis of rubber chemicals at a molecular level. This technology has led to the introduction of highly advanced material simulations and analysis, thereby allowing us to achieve enormous improvements in terms of the three major conflicting tire performance traits: grip performance, fuel efficiency and wear performance.

11:25 - **Insights into green tire tread performance and modelling**
Partheban Manoharan, junior research fellow, Rubber Technology Centre, INDIA
Silica in a highly dispersible form has become a staple filler in tire tread application in view of its inherent advantages. In the present study, ENR with 25 mol% of epoxide groups and NR is mixed with two different types of HD silica for superior reinforcement. The introduction of polar rubber into HD silica improves physico-mechanical, bound rubber content and dynamic mechanical properties of the composites. It has been successfully achieved in the absence of silane coupling agent. This paper explores the art of tire modelling for RR.

11:50 - **Polymer nano-filler interaction in the tire tread compound**
Arup Kumar Chandra, head global RM & ER, Apollo Tyres Ltd, INDIA
The magic triangle of a tire plays an important role in determining the fuel efficiency, safety, rolling resistance and service life of a tire. This paper deals with the preparation and characterisation of the hybrid nano-composites based on SSBR-BR blends with silica and nano-silica as the fillers after ?- and e-beam irradiation. Results reveal that the irradiated silica and nano-silica based hybrid nano-composites show remarkable enhancement in the polymer-filler interaction and reinforcement characteristics, extending the magic triangle remarkably and enhancing the physico-mechanical and dynamic-mechanical properties of the tire tread compounds.

12:15 - **Understanding the wear mechanism of tire tread compounds**
Prasenjit Ghosh, deputy general manager, Hari Shankar Singhania Elastomer & Tyre Research Institute, INDIA
The tire wear mechanism is a complex phenomenon and largely influenced by material composition, vehicle operating conditions and road surface. Thus it is extremely necessary for a compound designer to assess the influence of these parameters on wear during the compound development phase. This work investigates the wear characteristics of different tread compounds using a laboratory abrasion tester (LAT 100). Wear measurements were carried out over a wide range of severity by varying speed, test surface and slip angle, to simulate realistic service conditions of a tire. The analysis of wear results clearly indicates fatigue dominating wear mechanism.

12:40 - 14:00 - Lunch

14:00 - **Protection of diene-containing elastomers against cracks by ozone**
Jürgen Trimbach, director R&D, Hansen & Rosenthal, GERMANY
Elastomers, especially those with residual double bounds, show various kinds of ageing due to environmental influences: thermal ageing, thermal-oxidative ageing, crack growth by ozone attack, photo oxidation. This presentation describes the mechanism of ozone attack and the options for protection.

14:25 - **Spatial evolution of oxidative ageing of rubbers – quantitative characterisation**
Ulrich Giese, managing director, Deutsches Institut für Kautschuktechnologie eV (DIK), GERMANY
Concerning the lifetime of elastomers, thermal oxidative ageing is one of the most important processes. Post cross-linking with the consequence of higher stiffness and loss of dynamic properties or complete degradation of the polymer occurs. Responsible for irreversible changes of the polymer are radical reactions in presence of oxygen. For crack initiation under mechanical load, the 'diffusion limited oxidation effect' is responsible for a high heterogeneity of the material with a gradient in stiffness from outside into the bulk. Using modern analytical tools like micro-indentation, chemiluminescence, NMR relaxation and ATR-FT spectroscopy, this effect is quantitatively characterised in relation to physical properties.

14:50 - **Effect of rubber properties in compression mode on tire performance**
Vidit Bansal, manager, CAE (advanced engineering), CEAT Ltd, INDIA
In this paper experimental data on uniaxial tension, compression of tread rubber compound have been used to analyse the impact on tire footprint under constant load and while cornering during the simulation. A comparative study has been carried out to observe the effect of data on compression in the tire performance simulation. The footprint obtained from both of these simulations is compared with the actual tire footprint obtained by physical testing.

15:15 - 15:35 Break

15:35 - **Interactions between silica and epoxidised natural rubber**
Anke Blume, university professor, University of Twente, NETHERLANDS
Unmodified squalene (Sq) and epoxidised squalene (ESq), as models for natural rubber and epoxidised natural rubber, were mixed with silica in the presence or absence of TESPT silane coupling agent. Further studies involving various levels of epoxidation on natural rubber (ENR) in the absence of TESPT coupling agent, as well as a combination of ENRs with different loadings of TESPT, provide a better understanding of the various factors that influence the properties of silica-filled ENR compounds.

16:00 - **Morphology and nanomechanical properties of NR blends**
Anna Kepas-Suwara, materials scientist, Tun Abdul Razak Research Centre, UK
Due to the application of polymer blends and composites in tires there is a growing desire for micro-characterisation techniques that could lead to a better understanding of blend properties and how these relate to tire performance. Although polymer blends have been extensively studied on micro scale, simultaneous mapping of topography and physical properties of heterogeneous polymer materials has always been a great challenge. The development of an AM-FM technique has allowed simultaneous topography imaging and quantitative mapping of nanomechanical properties at a high spatial resolution.

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In this paper, the morphology and nanomechanical properties of NR blends will be discussed.

16:25 - **Development of high-speed rotating tire lateral stiffness measurement method**
Ryoji Hanada, engineer, Yokohama Rubber, JAPAN
It is well known that tire lateral stiffness influences vehicle dynamics. But lateral stiffness in service condition has not been measured until now. And tire construction designers use lateral stiffness measured in a static condition as common sense. In this paper, lateral stiffness in service condition (rotating at high speed) was measured with the non-contact shape measurement method. In addition, lateral stiffness variation corresponding to the trapezoidal slip angle input was measured. Tire lateral stiffness in service condition was found to be non-linear.

DAY 2 *WEDNESDAY 17 FEBRUARY* SESSION 1

09:00 - 15:40 - MATERIALS – POLYMERS

09:00 - **Macromolecular design at the service of the world of tires**
Antonio Giuseppe Solito, R&D scientist, Versalis, ITALY
Macromolecular design has become the key factor for the development of suitable materials for different applications. In the world of tires it is well known that, on the whole, performance is related to parameters like wet and dry traction, ice skid, rolling resistance and durability. In this virtuous equilibrium, processability, along the manufacturing process, should always be considered. Materials can be employed depending on their macromolecular characteristic, and anionic polymerisation is a very good toolbox to fine-tune structures and produce model architectures needed to boost selected properties. Branched and modified sSBR structures unravel the secrets of performance.

09:25 - **Development of functionalised synthetic rubber for low rolling resistance tires**
Sven Thiele, R&D leader process & product development anionic/synthetic rubber, Trinseo Deutschland GmbH, GERMANY
A new family of silica and carbon black interactive polymers was commercialised by Trinseo. The SSBR grades SPRINTAN-SLR-4602-Schkopau, SPRINTAN-SLR-3402-Schkopau, SPRINTAN-SLR-4502-Schkopau and SPRINTAN-SLR-4633-Schkopau enable reduced fuel consumption in tires. Recently the European Union adopted more stringent CO_2 emission targets for passenger cars and light trucks. The 2020 target (95g CO_2/km) requires an emission reduction of 40% compared with the 2007 fleet average of 158.7g/km. This trend will drive research activities in the field of SSBR and BR for many years to come. Currently, advanced polymer grades are in different stages of development and plant implementation at Trinseo.

09:50 - **S-SBR development strategy for eco-friendly high-performance tires**
Hiromi Nakafutami, general manager, Asahi Kasei Chemicals Corporation, JAPAN
Asahi-Kasei Solution-SBR (S-SBR), developed with proprietary functionalisation and high molecular weight technology, brings significant improvement to the balance between fuel efficiency, wet grip and wear resistance of high-performance eco-tire treads. We will present our S-SBR grades and development strategy, the latest generation of functionalisation technology, and the mechanism of such performance improvements. We will also introduce our production capabilities, including our new 100kt plant in Singapore. Through its unique technology and strategic investments, Asahi-Kasei aims to become the global leader of functionalised S-SBR.

10:15 - **New SSBR grades for high-performance tires**
Sergey Bagryashov, head of Advanced Products Testing Laboratory, Sibur Innovation LLC, RUSSIA
The presentation will discuss: the variety of SSBR grades in the Sibur product portfolio; the current situation and plans for the future; evaluation of the key properties of tire tread rubber compounds.

10:40 - 11:20 - Break

11:20 - **Functionalising neodymium polybutadienes – next step forward for green tire applications**
Thomas Rünzi, technical manager, Lanxess Deutschland GmbH, GERMANY
High-cis-1,4 neodymium polybutadiene has become the polymer of choice to be blended with S-SBR and NR in green tire technology compounding. This type of high-cis-1,4 rubber imparts excellent dynamic properties and tread wear resistance due to its linear structure, narrow polydispersity and low vinyl content. In turn, these unique features result in a rubber phase that is a challenging candidate when it comes to processing, as well as for introduction of functional groups, since a complex catalytic system complicates end-chain functionalisation, and the lack of vinyl moieties hampers in-chain functionalisation. Lanxess will provide results showing that these restrictions can be overcome.

11:45 - **Development of high-cis polybutadiene rubber grades**
Malte Wohlfahrt, ESBR/HCBR synthetic rubber R&D, Trinseo Deutschland GmbH, GERMANY
The reduction of CO_2 emissions as well as the improvement of fuel efficiency is a major task in the

automotive industry, thus triggering an increased demand for eco-friendly tires with reduced rolling resistance. Trinseo's Synthetic Rubber Business has developed novel neodymium-based initiator systems as well as an extended functionalisation technology platform to produce high-cis polybutadiene rubber (HCBR) grades; thus supporting the further improvement of rolling resistance in tires by reduction of hysteresis loss of tire tread compounds.

12:10 - **Liquid butadiene and isoprene rubbers for sustainable product designs**
Marcel Gruendken, technical manager, Kuraray Europe GmbH, GERMANY
Kuraray has developed a series of liquid rubbers with molecular weights ranging from 5,000 to 70,000. The polymers, which consist of isoprene, butadiene and styrene, can be used by rubber processors to achieve improvements in properties and processing. They are designed to have a plasticising effect. The properties allow the materials to act as 'reactive plasticisers'. Liquid rubbers (KLR) can be used for a wide range of applications including tires. They can be used for various parts of the tire, including tread, carcass, sidewall, bead filler and rim cushion.

12:35 - **New insights into processing of neodymium-based rubber grades**
Saeid Kheirandish, processing expert, Lanxess Deustchland GmbH, GERMANY
Tires made with neodymium-based rubbers are known to have very good performance and low energy loss. Buna CB22 and Buna Nd22EZ are two of the highest-ranking NdBR products by Lanxess in this regard. The focus of the current study is development of compound properties, specifically the Mooney viscosity, in the course of the mixing process. The dependence of compound properties on the type of NdBR and natural rubber used, along with processing temperature, has been studied in this work. It was shown that compound properties systematically depend on the combination of NdBR, NR and start temperature used.

13:00 - 14:00 - Lunch

14:00 - **Cardanol grafted natural rubber for cost saving in tire industry**
Golokbihari Nando, professor, Indian Institute of Technology Kharagpur, INDIA
A new grade of natural rubber has been developed at the Rubber Technology Centre of IIT Kharagpur in India. Technical grade of cardanol from the cashew industry was grafted onto the natural rubber latex at room temperature and coagulated. The CGNR, as it is called, possesses multi-functional properties, simultaneously imparting plasticising effect, cure promoter, age resistance, improved physico-mechanical properties, excellent surface finish, dispersion of fillers and cost saving in processing by reducing mastication time and eliminating aromatic process oil addition, ultimately aiding the green tire revolution. In-house research has found it to be successful. Upscaling needs to be done.

14:25 - **Dual nanofillers reinforcement of epoxidised natural rubber**
Siti Salina Sarkawi, research officer, Malaysian Rubber Board, MALAYSIA
The chemical modification of natural rubber via epoxidation yields speciality rubber called epoxidised natural rubber (ENR). Epoxidation increases the polarity of natural rubber results in the rubber compatible with highly polar filler like silica. The combination of silica and graphene nanofillers give synergistic reinforcement of ENR. A good nanodispersion of fillers is visualised by atomic force microscopy. The ENR compound reinforced with dual nanofillers is an attractive choice for greener tire application

14:50 - **Epoxidised natural rubber in retreaded tires**
Paul Brown, head of Advanced Materials and Product Development Unit, TARRC, UK
Alongside the use of sustainable materials, retreading of tires has an important role to play in reducing the environmental impact of transportation. Ekoprena, derived from natural rubber, has a negative carbon footprint, and silica-filled Ekoprena has been shown to give both low rolling resistance and good wet grip. Hot-cap retreads have been successfully built and tested. Pre-cured tread slabs have been produced at a commercial facility, but building tires using conventional cement and cushion gum was unsuccessful, requiring the development of a new bonding system. Tires are in service trials and results will be described.

15:15 - **Modified cellulose ester for improved tire performance**
Mark Arigo, principal application development scientist, Eastman Chemical Company, USA
Cellulose esters are thermoplastic polymers largely derived from natural resources. For use as tire additives, the cellulose ester is modified to enable processing and dispersion in rubber compounds under typical mixing conditions. The addition of 3-10 phr of modified cellulose ester to a standard silica-filled tread compound is evaluated, and significant improvement in low strain modulus is observed. Tire test results show improved handling and cornering coefficient performance with minimal trade-off in rolling resistance while maintaining wet traction and wear. Modified cellulose esters can be applied to HP/UHP/summer tire formulations to recover cornering stiffness lost when using rolling resistance reduction technologies.

15:40 - 16:00 - Break

16:00 - 17:40 REGULATIONS AND COMPLIANCE

16:00 - **Tire curing – experiencing the new safety standard EN16474**
Harald Schmidt, certified (TUV) safety expert, Sick AG, GERMANY
After finalisation of the new C-Standard EN 16474, the first tire curing machines that are built according to the new and increased safety requirements are being delivered to the users. Besides an increased safety level, the presence of these new machines can present some challenges to tire manufacturers with respect to the physical location and operation procedure. The presentation provides some examples and offers some proposals for how to overcome these challenges.

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16:25 - **Tire and wheel damage from real and simulated road impacts**
William Woehrle, owner, Tire Forensics Investigations, USA
A pneumatic tire/wheel assembly is obviously vulnerable to severe impacts from road hazards. Impact performance has been extensively studied through the years, and a multitude of tests, facilities and equipment have been developed and utilised to this end. Lately, newly developed tire and wheel test facilities and procedures have been made available to accurately evaluate and analyse the effect of such impacts. This presentation will confirm the consequences of such impacts, and reject other commonly held opinions regarding impact performance of today's tires and wheels.

16:50 - **ISO determination method of bio-based content for rubber products**
Masao Kunioka, project leader, Japan National Mirror Committee (NMC) on ISO/TC 45, JAPAN
Japan National Mirror Committee (NMC) on ISO/TC 45 is now developing ISO 19984 parts 1-3 for determination of bio-based content for rubber products, to promote rubber products made of natural rubber and bio-based additives. Using bio-based products contributes to a decrease in fossil energy consumption and fossil CO_2 emission. Bio-based content can be determined from the concentration of carbon-14 in carbons in rubber products. Bio-based content values calculated from formulations and values measured from 14C amounts by accelerated mass spectroscopy correspond well.

17:15 - **Visions of the Iranian tire industry after sanctions**
Hooman Tootoonchi, R&D group, Pars Tire Company, IRAN
A nuclear agreement between Iran and the West has been welcomed by the tire industry in Iran and the world, with the two sides seeking to improve joint investments and cooperation. Iran has high potential to offer to investors, including: more than 50 years' experience in the tire industry; a large country with roads as the main means of transport; high potential with educated staff in the tire industry; an active market for production and sale of cars as well as proximity to the Middle Eastern market; supply of at least 50% of raw materials domestically.

DAY 2 *WEDNESDAY 17 FEBRUARY* SESSION 2

09:00 - 17:15 - PROCESS INNOVATIONS

09:00 - **Mixing parameters – the rubber mixer's tool belt**
Richard Jorkasky, technical manager, Kobelco Stewart Bolling Inc, USA
There are a number of mixing parameters that can affect the outcome of a rubber mix, and many of these are often overlooked. Mixing parameters include the type of rotor available, ram pressure, circulating water temperature, the addition scheme and others. Depending on the type of mixer one has, these parameters can become very important in making the desired product. The different parameters will be investigated as to how they affect a mix.

09:25 - **Optimising the mixing condition of silica/ compounds in tangential Banbury mixer**
Abbas Pourrashidi, R&D assistant manager, Yazd Rubber Industry Complex, IRAN
The presentation will discuss optimising the mixing condition of silica-containing compounds to achieve the best reaction between silane coupling agents and silica without exposure to premature cross-linking reactions.

09:50 - **Effect of aromatic oil on blend dynamics for tire treads**
Akansha Rathi, PDEng, University of Twente, NETHERLANDS
The aim is to understand: (i) the influence of aromatic oil on the dynamics each phase in S-SBR/BR blends, and (ii) the preference of the oil in either phase. S-SBR/ BR blends with varying concentrations of aromatic oil are studied. Broadband dielectric spectroscopy, a more sensitive technique to study the ?-relaxation process, is the primary tool employed. The distinct effective Tgs (Tgeff) of the S-SBR and BR phases are obtained by deconvolution of the dielectric spectra of the blends studied. The Tgeff values obtained are corroborated with the model for phase dynamics of miscible blends by Lodge and McLeish (2000).

10:15 - **Halobutyl rubber processing behaviour: effect of oil on its rheology**
Ali Abbasian, assistant professor, Srbiau University, IRAN
Shabnam Ezzoddin, foresight researcher, Barez Industrial Group, IRAN
Processing behaviour of halobutyl rubber in a wide range of shear rates corresponding mixing and extrusion processes has been studied by means of capillary rheometer compared with Mooney viscometer. The effect of extending rubber with different amounts of process oil on processability of rubber is studied as well. Several parameters including pressure loss, wall slip, slip velocity and rheological behaviour of compounds have been studied. The results showed that all rubber compounds exhibit wall slip and as the oil content increases, the slip velocity increases as well.

10:40 - **Highly efficient mixing**
Johannes Jenissen, managing director, RADO Engineering GmbH, GERMANY
The presentation will discuss highly efficient mixing by distinct utilisation of friction, speed and rotor positioning within the mixing process. To release effective mixing within different processing steps you need adaptable equipment. Retrofitting an existing tangential internal mixer with modern drive technology and process control offers many options to increase product quality, output and cost reduction.

11:05 - 11:20 - Break

11:20 - **New truck tire building machine**
Jan Grashuis, vice president global R&D, VMI Group, NETHERLANDS
After years of success with the VMI VAST, VMI has introduced a successor to this four-drum radial single-stage truck tire building machine. The new truck tire building machine is an evolution of our existing mechanical tire building technology and

includes many functional improvements as well as higher performance. The new machine will fit in the range of the MAXX technology machines we have developed in the last decade, and features the well-known and recognisable design.

11:45 - **Strip winding system**
Mário Kaprálik, R&D manager, Konštrukta-Industry AS, SLOVAKIA
State-of-the-art strip winding systems ensure an effective production process with high application accuracy, repeatability and an ergonomic operator's environment. Line customisation offers a wide variety of technology influence possibilities.

12:10 - **Release agents – the relevance of an imperceptible product**
Manfred Breining, sales manager, Münch Chemie International GmbH, GERMANY
Automated processing of rubber, highest quality standards and continuous progress in productivity are the chief features of the tire industry. Although machinery and compounds are commonly regarded as the primary means to achieve these goals, the relevance of the release agent is often unfairly neglected. Münch Chemie International develops and produces various kinds of release agents enabling the tire producer to safeguard the entire process at the highest levels. This presentation outlines new developments from Münch Chemie International.

12:35 - **Mould release technology: overcoming curing and tire design challenges**
Hilton Pryce Lewis, president, GVD Corporation, USA
To meet customer expectations and stay competitive, tire companies constantly innovate, developing new designs and better rubber compounds. The same complex tread patterns that enable better performance can also inhibit rapid removal of the cured tire from the mould. New compounds may be stickier, resulting in faster fouling and release problems. A new technology that combines the advantages of several approaches is presented: an ultra-thin coating applied at room temperature using an environmentally favourable process. The coating is compatible with spring vents, microvents and intricate siping, and reduces fouling, provides release, and improves quality and consistency of tire finish.

13:00 - 14:00 - Lunch

14:00 - **Latest insights into high-quality truck and bus tire retreading**
Dirk Reurslag, sales director industrial solutions, VMI Group, NETHERLANDS
In addition to VMI's main focus on innovative solutions for the production of new tires, the VMI R&D team also looks at the tire retreading process. The VMI extrusion division has been active for well over a decade with the extrusion-smearing technology for cushion gum application. By overlooking the total processing in a retreading plant, more potential for improvement can be recognised. How to minimise intermediate handling and storage and how to make quality and quantity less dependent on human interventions? The latest VMI RETRAX programme includes features and options that bring such advantages.

14:25 - **Dry ice surface preparation solutions for global tire technology requirements**
Ahmet Erdogan, global key account manager, Cold Jet Deutschland GmbH, GERMANY
Cold Jet, the world leader in dry ice cleaning and surface preparation systems, will discuss how its environmental dry ice cleaning can fulfil the requirements of the tire industry. The presentation will explain how to efficiently improve the cleaning results and reduce the cleaning time while consuming less dry ice and air, and contributing at the same time to a better and more environmentally friendly workplace. The most important step for efficient tire manufacturing is the selection of the right cleaning solution, which ensures enhanced mould cleaning that is faster, produces less noise and uses less medium.

14:50 - **Effect of temperature on processing and cured product performance**
Saikat Das Gupta, chief scientist - vice president, Hasetri, INDIA
Rubber product manufacturing is a highly energy-consuming industry. In every process of rubber product manufacturing, including mixing, extrusion, calendering, curing, etc., cyclic heating and cooling is needed to achieve consistent product performance. The process engineer is solely responsible for adjusting the heat history of the in-process rubber compounds with respect to time and temperature, to maintain the required physical and processing properties. In this paper, the authors have tried to measure different properties in different time-temperature conditions to optimise the processing and performance properties of tires.

15:15 - **Peroxide/sulphur tire curing: results, advantages and applications**
Reza Limoochi, senior technical manager, Khuzestan tire, IRAN
To achieve the best properties in tire services, sulphur curing makes good mechanic and flex on polymer chains. C-C bond on peroxide curing makes high-resistance thermal properties. The proposed curing system outlined in this paper could offer many advantages plus the two previously mentioned characteristics.

15:40 - 16:00 - Break

16:00 - **Increased adhesion of permanent bladder coating**
Steffen Sandhoefner, head of application technology auxiliaries, Rhein Chemie Rheinau GmbH, GERMANY
Permanent bladder coating is known as a technology to enable the production of tires based on demanding technologies. Cost-effective production is related to the lifetime of the bladder coating, because early failure or necessary recoating during production leads to long maintenance and setup times. Actual technologies often show a limited lifetime of a coated bladder system due to coating tear-off. Our latest tests show that a special surface treatment of the curing bladders in combination with a tailor-made permanent bladder coating chemistry could result in noticeable increases in the lifetime of the coated bladders.

CONFERENCE PROGRAMME

16:25 - **Final finish automation solutions improving efficiency, productivity and quality**
Shaun M Immel, chief technology officer, Micro-Poise Measurement Systems, USA
Requirements for final finish equipment in today's tire manufacturing plants are critical for managing the great diversity in products and the drain of in-plant specialists available to maintain these processes. Higher levels of automation provide greater consistency in measurement and detection, and enable labour resources to be freed from non-value-added activities and redirected, providing higher value to the tire company. This presentation outlines several new developments that provide better ease of use, automatic setup and operation, and greater measurement and detection capabilities, enabling companies to remain competitive and increase profitability through efficient final finish processes and improved production quality.

16:50 - **Efficient tire labelling**
Frederic La Brie, president, Tekno Label, CANADA
The presentation will discuss labelling methods – manual vs. automatic; print on demand – digital printing technologies: thermal vs. inkjet, in-house vs. outsourced, cost comparison; label substrates – when to use what: films – PET, vinyl, BOPP, adhesives – hot-melt, emulsion, liner – PET, paper.

DAY 2 *WEDNESDAY 17 FEBRUARY* SESSION 3

09:00 - 17:30 - MODELLING

09:00 - **Latest tire modelling and testing developments at Jaguar Land Rover**
Jan Prins, technical specialist, Jaguar Land Rover, UK
The presentation will include the development of a thermally sensitive magic formula model, development of a dedicated flat track test procedure, vehicle-based tire testing, and more.

09:25 - **OpenTIRE – lessons learned and the path ahead**
Henning Olsson, director, research & development, Calspan Corporation, USA
Since it was first announced at the Tire Technology Expo in 2015, OpenTIRE, an open-source tire modelling project, has continued to grow. Based on feedback from leading industry experts and tire model users, as well as newcomers to tire modelling, the project's goals and road map have been further refined. The path forward, along with technical challenges, will be presented.

09:50 - **GS2MF – an advanced tire test procedure for Magic Formula models**
Gregory Smith, director, Tyre CAE and Modelling Consultants, UK
GS2MF is an innovative and highly efficient flat-track tire test procedure used to gather data to parameterise MF6.1 tire models.

10:15 - **Introduction of a finite-element model to predict rolling radius**
Dror Rubinstein, senior researcher, Technion - Israel Institute of Technology, ISRAEL
A detailed finite-element model for tire and soil was built. The soil model allows a large degree of deformation and flow. The model was verified by means of experiments in the soil-bin laboratory at the Technion. Good correlations were obtained between the experimental and model results. A method to determine the rolling radius was developed. Using the newly developed FEM model, some definitions for zero-slip condition were examined. The results indicate that the best criterion for zero-slip condition is definition of zero slip as the point at which the gross traction force is equal to zero.

10:40 - **Parametric method of tire contour design based on numerical modelling**
Romina Cornistein, researcher, FATE Tires - Argentina, ARGENTINA
The tire contour is an important design factor that influences the main tire performances, such as manoeuvrability, rolling resistance and durability. This presentation proposes a parametric method of tire contour design based on numerical modelling. Exhausted exploration of the input space requires excessive computational resources, which makes it impossible to do due to time constraints. An innovative response surface based on sequential optimisation procedure has been applied to speed up the design process.

11:05 - 11:20 - Break

11:20 - **Experimental and theoretical investigations of rubber friction and tire traction**
Manfred Klueppel, head of department, DIK, GERMANY
The progress in physical understanding and modelling of the friction behaviour of elastomers at rough, self-affine interfaces provides a basic tool for describing the traction mechanisms of tires with road tracks during cornering and braking, especially in the case of anti-blocking systems. Deeper insights into the traction mechanism of tires allows for the development of tailor-made tread compounds for specific applications, e.g. for dry, wet or ice traction. Furthermore, it can offer useful hints for understanding the various wear mechanisms of tire treads under different service conditions, since these mechanisms depend strongly on the sliding conditions.

11:45 - **A physically motivated model for filled elastomers**
Rathan Raghunath, research assistant, DIK, GERMANY
The Dynamic Flocculation Model is a micro-structure-based model of rubber reinforcement, which is developed on a physical framework to describe the non-linear and inelastic mechanical behaviour of filled elastomers. This one-dimensional material law has been implemented in the finite-element code using the concept of representative directions. The model shows very good agreement with the standard quasi-static multi-hysteresis tests on CB-filled elastomers. An extension of this model to include time-dependent effects allows consideration of

the filler-induced dynamic response such as strain rate dependency, amplitude dependency and stress relaxation.

12:10 - **Coarse-grained molecular dynamics simulations of silica-filled polymers**
Alex Trazkovich, research engineer, Cooper Tire & Rubber Company, USA
An understanding of how fillers act to adjust polymer properties is critical to tread material design, where hysteresis must be controlled to optimise the trade-off between traction, rolling resistance and wear. To develop such an understanding at a molecular level, we simulate a simple nanocomposite consisting of a single spherical nanoparticle surrounded by freely jointed polymer chains. The results show a significant difference in relaxation times for polymers near and far from the particle surface. How the thickness of the restricted mobility region changes as a function of nanoparticle size and polymer-nanoparticle adsorption strength will also be discussed.

12:35 - **Simple model polymer nanocomposites and effect of interfacial adsorption strength**
Lisa Hall, assistant professor, The Ohio State University, USA
We study polymer nanocomposite properties using a simple coarse-grained model polymer and spherical nanoparticles. Prior work showed that the miscibility of nanoparticles depends strongly on polymer adsorption; we adjust only the monomer-particle pairwise interaction strength as a way to consider different chemical systems. Through molecular dynamics simulations, we show how the dynamics of adsorbed and free polymers are different, and relate this to overall material properties. We also studied the effect of spheres on the entanglement structure of an otherwise non-interacting system of random walks to show how geometry contributes to the entanglements in typical nanocomposites.

13:00 - 14:00 - Lunch

14:00 - **Reduction of tire temperature by controlling the flow field**
Hiroshi Nashio, engineer, Toyo Tire & Rubber Co Ltd, JAPAN
Tire temperature during running greatly affects the durability of the tire, so a temperature reduction technique is required. It is known that a tire can be cooled by controlling the flow in the vicinity of the tire surface. To show the effectiveness of the thermal fluid analysis in the tire problems, we built a prediction technology of tire air-cooling phenomenon by computer fluid dynamics, and investigated the influence of the surface shape on the cooling effect. In addition, we validated the cooling performance by the wind tunnel test about predicted high cooling effect shape.

14:25 - **Lifetime prediction based on statistical occurrence of material defects**
Marvin Ludwig, engineer, Deutsches Institut für Kautschuktechnologie eV, GERMANY
High-resolution x-ray computer tomography is a powerful tool to achieve knowledge about the structure inside elastomer materials. In combination with Wöhler experiments for different sample geometries it is shown how the service life of elastomer parts is influenced by the local particle size distribution and the volume size under load. An approach is presented to show how dynamic crack propagation experiments can be used together with knowledge of the flaw size distribution in the excited volume to estimate the average lifetime of elastomer parts.

14:50 - **Optimisation of tire construction for rolling resistance reduction using FEM**
Mohammadreza Hosseinkhani, tire designer, Barez Tire, IRAN
In this study, the construction and contour of passenger car radial tire was optimised for low rolling resistance using Abaqus finite-element code. Among the different tire design parameters, critical parameters were identified by the design of experiment (DOE) method. For verification of the rolling resistance computed through finite-element simulation, the prototype of tires with low rolling resistance was fabricated and tested in a real indoor rolling resistance test machine. The simulation and test results showed that optimisation of tire construction can cause a reduction in rolling resistance coefficient of about 14%.

15:15 - **Advanced structural MBD tire modelling for complex vehicle simulation scenarios**
Francesco Calabrese, tire and vehicle modelling engineer, Fraunhofer ITWM, GERMANY
CDTire/3D is a structural MBD tire model with dedicated descriptions of the main constructional elements (carcass, cap ply and belt layers), sidewall and tread pattern. The model has been extended in recent years to reproduce belt/sidewall and sidewall/rim contact and include thermodynamics. The authors will show how this tire model can be used in MBS-driven full-vehicle scenarios to simulate applications in different development areas that could not be covered before. These applications vary from the simulation of a sudden inflation pressure loss and its effect on vehicle stability, up to advanced handling applications including temperature effects and complex contact patch analysis and synthesis.

15:40 - 16:00 - Break

16:00 - **Advances in motorcycle tires modelling – data analysis, thermodynamics and wear**
Flavio Farroni, research fellow - vehicle dynamics engineer, University of Naples, ITALY
The presentation is focused on the latest results obtained in the field of tire modelling by the Vehicle Dynamics group at the University of Naples. In particular, the activities developed in collaboration with Ducati Corse have offered new possibilities for employment of the TRIP-ID and TRT modelling tools. The first one is able to provide track data analyses and processing, ultimately aimed to the identification of MF model parameters. The second one is a real-time thermodynamic tire model, adapted in its latest release to the needs of the racing motorcycle industry.

16:25 - **Numerical modelling of pneumatic tires interacting with deformable terrains**
Chrysostomos-Alexandros Bekakos, PhD student, Loughborough University, UK
Although considerable research has been done for on-road tire performance, literature and tire modelling around off-road tire behaviour is quite limited. In this work, the interaction between pneumatic and rigid wheels under purely indentation and quasi-static rolling conditions interacting with deformable terrains is being studied using the finite element code Abaqus 6.13. Numerical models have been developed, and close agreement with experimental data from the literature is observed. The effects of the vertical load, the tread pattern and the inflation pressure are investigated and useful results are extracted.

Modelling Discussion

CONFERENCE PROGRAMME

DAY 2 *WEDNESDAY 17 FEBRUARY* SESSION 4

09:00 - 17:15 - TIRE INNOVATIONS

09:00 - **From objective tire testing to objective tire design**
Daniel Pugliese, R&D engineer specialist, Pirelli Tyre, Italy
Paolo Gavardi, senior applied research engineer, Pirelli Tyre, Italy
The presentation outlines a procedure to objectively design a tire. The first part explains the technical background, i.e. objective vehicle handling. Then it will describe the traditional approach developed from the late 1980s to objectify tire performance characteristics. It will then explain why this approach is not sustainable in the long run. Finally, the new approach proposed by Pirelli is presented.

09:25 - **Multifunctional high-performance rubbers for tire applications**
Gert Heinrich, director & professor, IPF Dresden, GERMANY
We report on new advanced and multifunctional rubbers for tire (and non-tire) applications. Energy-efficient tread compounds were designed using specific nanofillers as partial substitute of c.b. or silica. Super wear-resistant rubbers were developed using new concepts of autonomous self-healing. Chemically modified cellulose reinforced rubbers demonstrate new routes towards introduction of renewable fillers. High conductive rubbers were developed as sensors for operating tire control.

09:50 - **Lean-driven innovation powering product development at Goodyear**
Norbert Majerus, lean champion, Goodyear, USA
The presentation will cover the lean transformation at Goodyear and show how lean principles were used to significantly improve on-time delivery and reduce cycle times. At the same time the R&D throughput was tripled while improving the design quality. The presentation will address both the process of bringing new products to market and the creation of new ideas.

10:15 - **SMARTY – smart tire development project**
Zivojin Sekulic, consultant, GAJ, SERBIA
The future of the tire industry is production of intelligent (smart) tires. We are trying to develop a smart tire using the latest technology (sensors, signals and software) in tire production. The main aim of this project is to develop a revolutionary new tire that can predict failure during driving. Just imagine the revolution that will happen if each tire can predict failure and inform the driver of the vehicle about it.

10:40 - **Self-Inflating Tire technology (SIT)**
Maros Topoli, marketing director, Coda Development, CZECH REPUBLIC
SIT is a very simple, low-weight, peristaltic pump-and-valve arrangement, powered by the periodic deformation of the rolling tire. It is self-contained within the tire, and enables it autonomously to maintain itself at the correct pressure. When inflation is not required, which is practically all the time in a normal tire, the system recirculates air internally, which saves energy, reduces pump wear and has other technical advantages. For a damaged or defective tire, the system will in most cases maintain adequate pressure, providing the function of a runflat tire as a side effect.

11:05 - 11:20 - Break

11:20 - **Smart active tire pressure optimising system**
Prasad Muthukumar, engineer, TyreTronics, INDIA
The objective is to enhance a vehicle's overall safety, driving dynamics, stability, comfort, mileage and tire life, and reduce CO_2 emission by actively sensing and instantaneously controlling the tire pressure in critical situations. The presentation will cover: high speed/ emergency braking efficiency enhancement system; loss of traction/stability restoring and mitigation system; hydroplaning, rollover, over- and under-steering mitigation system; autonomous tire pressure maintenance system powered by kinetic brake energy for maintenance-free operation; potential tire damage and hazardous object detection and warning system; mitigating effects caused by tire puncture to sustain stability and steerability. The present system operates in complete compliance with ETRTO/JATMA/TRA standards.

11:45 - **Tire research at Leibniz Universität Hannover**
Matthias Wangenheim, assistant director, Leibniz Universitaet Hannover, GERMANY
Both experimental and theoretical research on the tire-road contact have a long tradition at the Institute of Dynamics and Vibration Research of Leibniz Universität Hannover. We will present the latest progress in experimental friction investigations, such as the portable

friction tester and high-speed camera insights into the rolling contact. On the theoretical side we will show our approach towards modelling mixed friction in the tire-road contact, combining relevant friction mechanisms.

12:10 - **Goodyear leading steel tire cord evolution**
Robert Lionetti, R&D associate, The Goodyear Innovation Center, LUXEMBOURG
The selection of strength level and steel tire cord construction optimises tire performance, weight and cost. Goodyear has pioneered increasing steel tire cord strength levels, and has been driving up the industry capability over the last 30 years, making ultra-tensile strength state of the art. Increasing strength alone can bring benefits in reduced raw material usage and lower tire weights. However, to capture the full potential when making tire reinforcement changes, the steel tire cord construction must also be optimised for the application.

12:35 - **Challenges in Formula Student tire development**
Marco Gellings, director, Continental Reifen Deutschland GmbH, GERMANY
The requirements for a Formula Student tire differ greatly from normal PC tires, and therefore require special layout and testing methods. These differences and resulting challenges are shown in the example of the latest C16 tire development.

13:00 - 14:00 - Lunch

14:00 - **Smart lab method for prediction of a tire's mechanical crack initiation**
Radek Stocek, head R&D, PRL Polymer Research Lab, CZECH REPUBLIC
This work is dedicated to the process of crack initiation. In the case of tires in service, crack initiation is driven by revolving impact incidents. They force the load and deflection to the tire tread while it is in contact with the surface of the road. New lab testing equipment has been developed to characterise the crack initiation in rubber material for tire tread applications. This automated instrumented equipment simulates real tire loading conditions by generating a downsized single occurrence of impact with respect to variable parameters applied on different types of tires as well as asperities and terrain.

14:25 - **Glass and carbon-fibre cords for tires**
Christopher Stevens, technical manager, NGF Europe Limited, UK
NGF will present the historic use of glass cord for car tires. This will be updated with modern high-flex performance glass cords. It will introduce carbon-fibre and glass-carbon-fibre hybrid cords that are now available for car tires.

14:50 - **New generation of PET reinforcement material in UHP carcass**
Glenn Lim, technology director, Performance Fibers, HONG KONG
This study looks at the application of an advanced PET, in UHP carcass where material characteristics like thermal stability, high modulus and robust adhesion are highly desired. The study will focus on comparative

studies with commonly used materials in UHP carcass, namely rayon, HMLS and this new advanced PET. Comparative studies will focus on mechanical cord properties and how adhesion performances can be improved to reach rayon-like adhesion performance. The study will also include tire indoor testing results between these materials to look at how this new advanced PET performs in actual UHP tires. Carcass weight reduction via Aramid PET will also be shared.

15:15 - 15:35 - Break

15:35 - **Design of experiment (DOE) approach to tire tread formulation**
Anna Eriksson, technical coordinator, Nynas AB, SWEDEN
Evaluation of different raw materials or formulations for rubber compounding is often limited to a one-dimensional comparison study that gives limited information about the synergetic aspects of different ingoing components and/or loading effects on final properties of the rubber compound. This study is based on an experimental design approach where several parameters are evaluated simultaneously in order to build a multiple dimensional information base on how to best optimise formulations to steer certain properties in a tire tread formulation.

16:00 - **Silica morphology and functionality: addressing winter tire performance**
Timothy Okel, senior research associate, PPG Industries Inc, USA
Tire manufacturers maximise microhysteretic properties in studless winter tires for optimum traction. Recently improving the fuel efficiency without sacrificing other cold-weather properties as well as obtaining the traction of studded tires without the associated noise and road surface damage is of increasing interest. Studies indicate that high BR content provides favourable predicted winter tire performance. Higher Tg polymers like NR and sSBR are added to improve warm weather dry and wet traction and to improve rolling resistance. Higher loadings of lower surface area silica (e.g. Hi-Sil EZ90G-D) were also shown to provide an overall improved predicted winter tire performance.

16:25 - **Calendering process training course plan**
Francesco Maria Castelli, engineering project manager – training, safety and risk assessment, Comerio Ercole SpA, ITALY
Piergiorgio Crespi, sales director, Comerio Ercole SpA, ITALY
The development of skills and sharing of knowledge are vital factors for the activity of a solid, successful

tire calender line process for greenfield projects. Comerio Ercole introduces the ATHENA training course plan specifically designed for the purpose.

16:50 - **NY66 and PET new-generation reinforcement materials of Kordsa Global**
Ibrahim Ozgur Yildirim, chief technology officer, Kordsa Global, Turkey
Kordsa Global is one of the world's leading tire reinforcement producers. The company follows customer desires and focuses on presenting innovative and environmentally friendly products to the market. The presentation will highlight Kordsa's latest developments in NY 66, PET HMLS new-generation yarns and cords, as well as specialised branded products such as Twixtra, Capmax and Monolyx.

DAY 2 *WEDNESDAY 17 FEBRUARY* SESSION 5

09:00 - 11:05 TIRE TESTING (ON TRACK)

09:00 - **Development of year-round indoor winter testing facilities**
Harri Eskelinen, director, Test World Oy, FINLAND
Testing in winter conditions used to mean that testers were forced to travel around the world to find winter, or accept a limited test season. Test World has been a pioneer in the field of indoor winter testing, with world's first indoor winter test facility launched in 2013. Indoor 1 is focused on objective testing, and in 2015 we opened Indoor 2 to serve subjective testers – year round and without any risk of bad weather spoiling tests. In this presentation we'll talk about the development of Indoor 1 and 2 and the next step: Indoor 3.

09:25 - **Coast-by noise of different truck tires on four surfaces**
Gijsjan van Blokland, senior consultant, M+P consulting engineers, NETHERLANDS
The noise levels of 30 truck tires of different type and make are determined at four test surfaces, including an ISO 10844 section. Tests are done with speeds between 40 to 80km/h. Results on the ISO surface are compared with results on other surface types such as SMA 11 in order to understand the predictive power of type approval results for the performance on real roads. Results on 10844 are also compared with indicated noise label values. Of seven tires sets the retreaded version is included. Special attention is given to tonal components in the noise signal.

09:50 - **Influence of tire tread debris on wet traction performance**
Michael Morris, principal scientist, Cabot Corporation, USA
We have found that a large number of wear debris particles are present on the tread during normal tire operation, and postulate that this can influence tire performance. In highly accelerated lab tests, wet friction is decreased by the buildup of debris, and is improved when debris is removed from the interface. In wet traction road tests, a higher friction on wet asphalt is achieved when tires are manually cleaned, compared with the same tires that are not cleaned prior to tests. The results can potentially explain the differences in wet skid resistance between carbon black and silica-containing tread compounds.

10:15 - **Noise and rolling resistance of various types of winter tires**
Dr Ulf Sandberg, senior research scientist, Swedish National Road and Transport Research Institute, Sweden
Approximately 30 car tires of various winter construction, plus some 'summer' tires for reference, have been tested with regard to exterior noise emission and rolling resistance properties. The winter tires included several equipped with studs, winter tires optimised for Nordic conditions, winter tires optimised for central European conditions and all-season tires. Also, a couple of types with metal particles embedded in the rubber were tested. Since studded tires are impossible to test on laboratory drum facilities, all tests were made on two types of trafficked roads (with two pavements), using towed trailers constructed for the purpose (the so-called CPX method for noise and a new method for rolling resistance). As far as possible, loads and inflations were adjusted to those of the ECE R117 conditions. The results showed that the studded tires were substantially noisier than the non-studded variants, and that the winter tires without studs were quieter than the reference 'summer' tires. Very surprisingly, it appeared that the studded tires did not have higher rolling resistance than the non-studded tires.

10:40 - **Tire carcass temperatures measured using a radio-linked pyrometer**
Alan Bennetts, director, Bay Systems, UK
Rolling resistance manifests itself as heat in the tire. Measuring external temperatures as a way of estimating the amount of heat being generated is inaccurate due to surface cooling and other effects. Measuring the internal temperature of the bead, sidewall and tread using a multi-channel pyrometer generates accurate measurements of the temperature distribution over the tire carcass. Measurements are made with an accuracy of 0.5 degree and a resolution of 0.05 degree. Small changes in tire construction that manifest themselves in changes in rolling resistance can be detected and any analytical models updated.

11:05 - 11:20 - Break

11:20 - 13:00 LOGISTICS AND DISTRIBUTION

11:20 - **QR code reading in tire manufacturing and distribution**
Gasbar Ursan, senior sales manager automotive Europe, Cognex Germany, GERMANY
Laser-marked QR codes on tire sidewalls, which make every tire unique and traceable, are becoming increasingly popular. Although end customers can read QR codes on tires with standard smartphone apps, professionals need more reliability, robustness and transparency in their industrial processes. This presentation shows how to read the QR code with professional image-based handheld and fixed-mount readers in the tire manufacturing and distribution environment.

11:45 - **SCANNECT – next-generation QR codes for total tire traceability**
Judith Harhues, key account manager tire/ automotive, 4JET Technologies GmbH, GERMANY
SCANNECT – laser marking of unique codes on tire sidewalls – provides 100% traceability and customer connectivity through the tire lifecycle. State-of-the-art laser technology and sophisticated process development allow high-precision laser engraving of QR codes on tire sidewalls in 100% automated processes. The enhanced contrast black-on-black allows reading the QR code with smartphone apps, industrial handheld ID readers or even automatic inline tracking systems. This takes traceability to a complete new level – throughout the tire's lifecycle.

12:10 - **Introducing the smart tire**
Marc Flederus, founder and owner, Ferm RFID Solutions, NETHERLANDS
Ferm RFID Solutions has developed a complete RFID tag portfolio for the tire industry worldwide. These tags can even be integrated into the tire before curing. The total solution consists of a permanent rubberised patch tag for new and retread tires, a disposable adhesive RFID tag for new tires, and handheld and fixed readers to track the tires throughout their total lifecycles. Several large countries and tire producers are adopting this innovative RFID technique because of the huge benefits it brings.

12:35 - **Cardboard replacing metal shells in fabric conversion as green solution**
Klaus Hasenack, CPO, Glanzstoff Industries GmbH, AUSTRIA
It is a worldwide standard in tire cord fabric conversion to use metal shells for storage and transport of the fabric roll at the end of the dipping process. However, the lifecycle of these shells is fairly limited and it involves considerable logistical and environmental costs as well. This presentation will focus on the technical, commercial and logistical aspects of paper shells in comparison. These provide considerable savings throughout the related part of the supply chain of tire cord fabrics with a lower carbon footprint on top.

13:00 - 14:00 - Lunch

14:00 - 17:30 - SUSTAINABILITY

14:00 - **Sustainability in the global tire industry**
David Shaw, CEO, Tire Industry Research, UK
The paper examines sustainability issues around tires in a holistic way, evaluating energy footprints during manufacture, in use and disposal as well as new innovations and developments that help improve environmental credentials.

14:25 - **Managing sustainability in the tire supply chain – from risk management to value creation**
Pierre-François Thaler, co-CEO, EcoVadis, USA
Over the past decade, governments and corporations around the world have made the call for sustainability and ethical practices throughout business. As we move forward, incorporating sustainability/CSR into the buyer-supplier relationship is vital for an organisation's longevity. In this session we'll explore: the business case for sustainable supply chain; beyond compliance and risk management, how can it generate

value?; what are the tools and best practices used by leading Global 500 companies?; how could the tire industry foster deeper collaboration to drive systemic change in supply chain CSR practices?

14:50 - **Presentation to be advised**
Ali Hines, campaigner, Global Witness, UK

15:15 - 15:35 - Break

15:35 - **Compounding guayule rubber with silica**
Howard Colvin, senior scientist, Cooper Tire & Rubber, USA
The processing advantages of guayule rubber in silica compounds was demonstrated in an earlier discussion. This presentation will compare the compounded properties of guayule and hevea silica compounds.

16:00 - **Production of bio-based elastomers by direct fermentation to olefins**
Thomas Buhl, Global Bioenergies

16:25 - **Tire and rubber, innovation and sustainability**
Fabio Bacchelli, technical manager, tire, Versalis - ENI Group, ITALY
High-performance tires are mainly produced on the basis of silica/silane systems using blends of solution polymerised rubber and natural rubber. Recent requirements such as tire labelling and low environmental impact are pushing the rubber industry to a great effort in tailoring the polymer molecular architecture and optimising the chemical aspects of rubber-filler interaction. In this frame, the behaviour of up-to-date polymers for tire applications is discussed, with results of innovative polymerisation procedures or sustainable strategies. In particular, the use of bio-based materials provides a promising alternative to traditional oil extenders, plasticisers and rubber matrices.

Panel Discussion

CONFERENCE PROGRAMME

DAY 3 *THURSDAY 18 FEBRUARY* SESSION 1

09:00 - 13:00
TIRE TESTING (IN LABORATORY)

09:00 - **Rolling resistance of tall and narrow tires**
Giovanni Palumbo, engineering senior specialist, FCA Italy, ITALY
A test bench analysis has been developed to compare the rolling resistance coefficients evaluated by means of ISO 28580 regulation of three sets of unconventional sizes provided by different tire makers with conventional ones that are equipping FCA vehicles, in order to improve vehicle efficiency. A possible future fuel economy improvement has been estimated.

09:25 - **Wanted: precision tire performance tests in tomorrow's smart factory**
Gerald Potts, CEO / CTO, TMSI LLC, USA
Smart tire factories are being built with dimensional and structural measurement feedbacks into central information banks, and closed-loop controls to ensure green tire uniformity to within increasingly tighter specifications. What about end-of-line performance of the resulting tires? Final finish measurements include low-speed uniformity, but will expand to high-speed uniformity, and rolling resistance testing to confirm specified performance and to identify sources and quantify required factory adjustments on the fly, rather than days or weeks later after central lab tests. Tomorrow's tire customer will demand constant adherence to tire performance specifications.

09:50 - **Identifying critical flaws in silica tread compounds by x-ray CT**
Frederick Ignatz-Hoover, technology fellow, Eastman Chemical Company, USA
Computer aided tomography (CT) techniques are crossover technologies now offering significant potential to provide quantitative insights into the state of particle dispersion in a rubber compound. The CT technique offers a fairly rapid analysis and provides a degree of resolution previously difficult to characterise. This paper will provide a brief example of CT measurements, demonstrating the ability to identify critical flaws in silica-filled tread compound. The system studied is a silica-filled styrene-butadiene rubber vulcanisate, in which silica surface area, silane concentration and mixing conditions are varied in order to develop a range of filler dispersion states.

10:15 - **Tire test control algorithms and their effect on data quality**
Henning Olsson, director, research & development, Calspan Corporation, USA
Tire force and moment data generated from laboratory testing has many applications in the tire and vehicle development process. The data accuracy and quality may therefore play a significant role in engineering decisions. A study has been carried out to quantify the effects of the methods by which the force and moment data is collected. Based on the results, which identified parameters with a large impact on the data quality, new control algorithms were evaluated and their effectiveness on tire data accuracy and quality are presented.

10:40 - **Speed ratings and belt overlays: a materials perspective**
Bruce Lambillotte, general manager, Akron Laboratories and Tire Service, USA
Smithers' proprietary database of tire analyses will be accessed to benchmark passenger tire belt overlay ('cap plies') construction details. This information will then be correlated to speed ratings to create generalisations regarding reinforcing materials usage in tire belt overlays.

11:05 - 11:20 - Break

11:20 - **Shearography systems for tire inspection**
Rainer Huber, product manager, Carl Zeiss Optotechnik, GERMANY
The presentation will show shearography systems and the plans of Carl Zeiss Optotechnik to extend its presence in the tire manufacturing market, offering benefits for customers using test and measurement systems from Zeiss.

11:45 - **Bringing outdoor tire test surfaces indoor on Flat-Trac at NTRC**
Anudeep Bhoopalam, tire simulation engineer, National Tire Research Center, USA
The purpose of this presentation is to provide insight into the National Tire Research Center (NTRC)-led research designed to correlate indoor flat-belt laboratory test surfaces to outdoor asphalt surfaces. The presentation will present a methodology for the collection and use of indoor and outdoor test data to develop force-and-moment surface transformations. Furthermore, information will be provided about other research methods that will make the indoor test surfaces more representative of outdoor test surfaces.

12:10 - **Dynamic tire testing using the National Tire Research Center's LTRe**
Kevin Kefauver, technical director, National Tire Research Center, USA
The purpose of this presentation is to demonstrate the dynamic capabilities of the NTRC Flat-Trac tire testing machine (LTRe) by providing robust tire test results. Data and a corresponding analysis will provide insight into how the lateral, longitudinal and combined handling response of the tire are affected by transient or dynamic vertical oscillations. This work relates to how the tire handling performance is modified under the influence of tire ride disturbances.

12:35 - 14:00 - Lunch

DAY 3 *THURSDAY 18 FEBRUARY* SESSION 2

09:00 - 13:00
MATERIALS, FILLERS AND ADDITIVES

09:00 - **Ultra-high surface area silica-based tire tread compound performance**
John Kounavis, applications manager, Industrias Negromex, USA
Tire tread compounds based on ultra-high surface area silica fillers, with CTAB surface area values of 230 to 250m2/gm, provide a unique balance of performance between RR, wet traction and wear resistance. The high levels of reinforcement that are associated with such high surface area silica fillers normally result in compounds that are not mixable or extrudable. The Emulsil Silica Masterbatch technology is a feasible route to produce high surface area silica-based tread compounds. This presentation will review the compound performance of commercially produced ultra-high surface area Emulsil products.

09:25 - **Current sulphur-cure systems are no longer viable for tires**
Ali Ansarifar, senior lecturer, Loughborough University, UK
Zainudin Umar, research student, Loughborough University, UK
Exact correlation between rubber properties and chemical curatives has eluded rubber scientists for years. Polybutadiene rubber was reinforced with precipitated silica, the surface of which had been pre-treated with a sulphur-bearing bifunctional silane. The silane chemically bonded the silica to the rubber. The rubber was primarily cured by using sulphur in the silane and an accelerator and an activator. The flex life of the rubber vulcanisate was subsequently measured and found to depend on the accelerator/activator weight ratio very precisely. Moreover, there was a correlation between the two, which could be defined with a simple mathematical equation.

09:50 - **An inside view of silica-filled NR for tread applications**
Pamela Martin, materials scientist, TARRC, UK
Although it is approaching a quarter-century since silica/silane-reinforced s-SBR/BR was shown to give significant reductions in rolling resistance and wet skid performance, the incorporation of silica into NR-based tread compounds has largely been unsuccessful due to the poor action of silanes. Thus, understanding the silica surface and its interaction with NR, silanes and curatives is crucial to the successful adoption of this technology in NR. This paper will discuss silica-filled NR and provide an insight, through 'network visualisation' TEM, into the consequences for dispersion, cross-linking, rubber-filler interaction and physical properties when surface-modifying ingredients are added.

10:15 - **New generation of carbon blacks for modern truck tires**
Florian Diehl, technical market manager, Orion Engineered Carbons, GERMANY
Modern truck tires have reached an excellent performance level with respect to tread wear and rolling resistance. Regarding rubber reinforcement, carbon black is still the prevailing material. To manage performance conflicts, the tire industry can rely on a wide range of carbon black grades, which differ mainly in specific surface area and structure level. In this presentation the performance enhancement of newly developed carbon black grades with narrow aggregate size distribution will be highlighted. Experiments and tire tests demonstrate that wear performance improvements of more than 10% can be achieved while keeping the rolling resistance level constant.

10:40 - **Improved rolling resistance using f-SSBR, silica and a mercapto silane**
Michael York, senior manager - silanes/tire, Momentive Performance Materials Inc, USA
High energy loss in tires leads to poor fuel economy. One approach to improve fuel economy has been to employ silica with a silane coupler in tread compounds to reduce rolling resistance while minimising performance trade-offs. A virtually ethanol-free mercapto silane was compared with standard sulphur silanes in passenger tire tread compounds containing f-SSBR and medium to high silica loadings to reduce rolling resistance. Reductions in Tan ? at 60°C greater than 10% were obtained without loss in compound processing or properties. The new mercapto silane can improve fuel economy without loss of other tire performance parameters.

11:05 - 11:20 - Break

11:20 - **Processing promoters as problem solvers for silica compounds**
Torsten Ziser, application specialist, Rhein Chemie Rheinau GmbH, GERMANY
One of the core skills of the Lanxess Rhein Chemie Additives business unit is supplying processing promoters for tire applications under the brand names Aflux and Aktiplast. Key properties of processing promoters are to facilitate the processing and to improve the filler dispersion. These chemicals reduce compound viscosity, whereas their influence on the mechanical-dynamic properties of the vulcanisates is different. The processing promoters therefore have a significant influence on tire performance. Now two more processing promoters complete the range of products. In this presentation Rhein Chemie Additives' processing promoters are compared, and the advantages of each additive are worked out.

11:45 - **Crack growth improvement with micronised rubber powder in sidewall compounds**
Glenn Denstaedt, technical director, Lehigh Technologies, USA
Over one billion tires are removed from service each year, requiring new sustainable methods to recover the value of these post-consumer materials. The European Union and the United States have instituted programmes to recover and recycle over 95% of removed tires. Reuse of materials in tire and rubber formulas captures the sustainable value of these materials. The use of micronised rubber powder in tread compounds for improved cost and sustainability is well established and in use by most major tire companies. This work was designed to demonstrate the potential use of micronised rubber powder in tire sidewall compounds.

12:10 - **Resorcinol-free compounding technology in high-performance aircraft tires**
Abilash Kumar Nair, materials development engineer, Dunlop Aircraft Tyres Limited, UK
The operational requirements of aircraft tires are widely different to automotive passenger or truck tires. Moreover, the performance of the tires over a wide range of service conditions is essential for aircraft safety. It is recognised that rubber compounding technology, along with appropriate design and materials selection, is vital to achieve this. This paper investigates the effect of an environmentally friendly resorcinol-free adhesion promoter and different carbon black types on the performance of the rubber compounds used in the making of aircraft tires. The cure optimisation, physical properties and cord-to-rubber adhesion characteristics of the compounds are reported.

12:35 - **Surface-treated calcium carbonate as an environmentally friendly filler**
Mercedeh Malekzadeh, assistant professor, Tehran North Branch, Islamic Azad University, IRAN
Saeed Taghvaei-Ganjali, manager, Iran Yasa Tire and Rubber Company, IRAN
In this study, the poly propylene glycol (PPG) surface-treated calcium carbonate/carbon black were applied as dual fillers in the rubber compounds based on NR/SBR. This natural material was used due to its cheapness and environmentally friendly features. In order to improve the compatibility of the calcium carbonate with rubber, surface treatment by PPG was considered. The treated samples were used as fillers in the blends. The rheological and physico-mechanical properties of the compounds were studied. Results showed that the compound that contained 1% PPG treated calcium carbonate can reduce 8.5% of the used carbon black and preserve the compound properties.

13:00 - 14:00 - Lunch

DAY 3 *THURSDAY 18 FEBRUARY* SESSION 3

09:00 - 13:00 - REINFORCEMENT

09:00 - **How to achieve high-quality parameters in the tire cord industry**
Karl-Hermann Paul, senior specialist and consultant textile technology, Allma Volkmann, Zweigniederlassung der Saurer Germany GmbH & Co KG, GERMANY
The latest trends in tire manufacturing, such as optimum driving comfort and absolute safety, also place the highest demands on tire cord quality. Textile-physical properties of tire cord particularly include maximum tensile strength, EASL and twist uniformity. It is important that these properties be guaranteed within certain tight tolerances. Every tire manufacturer issues quality standards that have to be met by the tire cord producer. The presentation will show how the parameters in the twisting process influence the textile properties of tire cord. Using the example of commissioning of twisting machines, we show how to set and permanently secure the highest product quality.

09:25 - **Profit and challenge – converting to 20m/min**
Alois Felder, head of product management, Lindauer Dornier GmbH, GERMANY
Tire cord production speed has increased to up to 1,000rpm or 20m per minute. Plant conversion can be profitable, but optimisation of organisation and planning is necessary to achieve an optimal production result.

09:50 - **Steel cord adhesion and cobalt polymers as safer adhesion promoters**
Stephen Fulton, research & development manager, Umicore Specialty Materials Brugge, BELGIUM
Cobalt adhesion promoters are essential for adhesion and durability of steel-rubber bonds. There is uncertainty, stimulated by data collection under REACH, about the future hazard classification of cobalt-based adhesion promoters. Umicore has developed cobalt polymers that are proving non-hazardous. This is a unique solution for the tire manufacturer, who can safely continue to use cobalt for bonding. The presentation will give an overview of the latest position in classification of cobalt from the perspective of a supplier to the industry. Also, the situation of cobalt polymers from USMB will be updated in relation to bioavailability and hazard assessment.

10:15 - **Optimising the steel cord inspection system by magnetic field simulation**
Joachim Manz, general manager, Roland Electronic GmbH, GERMANY
The sensor design of the steel cord inspection system was studied with magnetic field simulation. One aim of the study was to optimise the field concentrator geometry to approach the optimum distribution of the magnetic field. Geometry optimisation was accomplished using a finite-element solver (COMSOL). Discussion of the signals will offer a deeper look into the capabilities of the magnetic measurement of steel cord material.

10:40 - **Sustainable reinforcement**
Andreas Flachenecker, technical marketing and development manager, PHP Fibers GmbH, GERMANY
Polymers based on renewable resources could be an alternative for fossil-based polymers. This presentation focuses on the bio-based polyamide polymers PA 4.10, PA 6.10 and PA 10.10 in comparison with the established fossil-based polymers PA 6 and PA 6.6. It covers polymer properties as well as yarn properties that are derived from spinning trials. Application studies contribute to further assessment.

11:05 - 11:20 - Break

11:20 - **More environmentally friendly alternatives for bio-based materials in tires**
Heidi Beers, specialist eco efficiency services, Teijin Aramid, NETHERLANDS
Bio-based materials have the benefit of a low carbon footprint per kg. However, it is not the amount per kg that is decisive, but the amount per function. Fossil-fuel-based materials can outperform bio-based materials in their function over the total value chain. During the presentation examples will be provided.

11:45 - **Alternative textile coatings to RFL**
Thomas Kramer, expert for reinforcements & skim compounds, Continental Reifen Deutschland, GERMANY
For decades, textile reinforcements have been coated by resorcinol formaldehyde latex (RFL) dip to allow sufficient bondage to the surrounding rubber. RFL is the dominating industry standard worldwide. Now the picture is going to change. Both resorcinol and formaldehyde (RF) are under close supervision of legislative organisations. This is driving the current efforts to find a substitute for RF in the textile industry. Whether new regulations will require a switch is still open. In this presentation, Continental wants to share results obtained in a RF free dipping recipe.

12:10 - **Innovative surface modification of technical yarns for rubber adhesion**
Qasim Shaikh, development manager, Mehler Engineered Products GmbH, GERMANY
The surface modification of synthetic fibres through continuous low-pressure plasma technology was studied to understand the effects of cleaning, activation and plasma polymerisation on the surface modification, and its effect on textile to rubber adhesion. It was observed that this low-pressure plasma is able to remove the spin finish contents to over 30% without compromising fibre strength. Through this plasma activation the reference value of conventional wet chemical pre-activation could be exceeded after subsequent RFL treating, as indicated by the T-test adhesion comparison.

12:35 - **Highly efficient single-end cord dipping technology at Glanzstoff-Sicrem**
Ferdinando Prestini, CEO, Società Industriale Cremonese Sicrem SpA, ITALY
The Italian converter Sicrem SpA, a member of Glanzstoff Industries, has become a leading manufacturer of high-end single-end cord solutions for the tire industry worldwide. The presentation will focus on the technical challenges that have been mastered in the last 10 years, as well as giving an outlook on where single-end cord technology might move in the future.

13:00 - 14:00 - Lunch

DAY 3 *THURSDAY 18 FEBRUARY* SESSION 4

09:00 - 13:00 - RECYCLING

09:00 - **Suitability of present recycling techniques for manufacturing sustainable tires**
Arup Saha Deuri, head of R&D, Balkrishna Industries Ltd (BKT), INDIA
Recycling is considered to be a pathway to achieve sustainable products, and tires are no exception. Tire recycling techniques are critically reviewed with respect to quality, availability, impact on tire or compound properties in order to judge the suitability of the currently available recycled materials in tire manufacturing.

09:25 - **Potential and feasibility of tire recycling technologies**
Wilma Dierkes, associate professor, University of Twente, NETHERLANDS
Recycling is currently a heavily discussed topic, and recycled tire material to be reused for the same application is one of the spear points of current R&D activities. Regarding the immense number of used tires – every year about 800 million tires are discarded worldwide – we need more than just one outlet for the recycled material. Besides the commonly used particulate and reclaimed rubber, devulcanisates and pyrolytic char are under discussion and development. This presentation will compare and evaluate the different alternatives for material recycling of tire rubber.

09:50 - **Establishment of secure supply chains for renewable tire materials**
Kedar Murthy, vice president & general manager, Lehigh Technologies, USA
The performance of renewable micronised rubber powder (MRP) in tire compounds for improved cost and sustainability is well established and in use by many major tire companies. Multiple MRP production technologies deliver equivalent performance, removing sole sourcing as a supply chain concern. With the current supply chain and technology, a typical MRP usage level is 5% over compound formula weights in common tread applications. Supply chain and technology improvements may enable up to 20% use of these renewable materials in multiple tire compounds, not just in tread.

10:15 - **Feasibility study for end-of-life tire recycling in new tire production**
Khaled Feriha, research & development manager, Trenco, EGYPT
End-of-life tires constitute one of the biggest environmental concerns in terms of environmental pollution and resources conservation. This study aims to determine the best proportion of reclaimed rubber and crumb rubber to be added as part of the constituents used in the manufacturing of three different tire parts (tread, sidewall and inner liner) to produce standard products. Batches were prepared, and reclaimed rubber and crumb rubber were added to the formulation of three different tire parts. Batches were analysed according to standards to select the optimum

CONFERENCE PROGRAMME

percentage that can be introduced in new tires.

10:40 - **Screening of devulcanisation aids for waste truck tire rubber**
Vignesh Kumar Rajendran, PDEng, University of Twente, NETHERLANDS
Recycling of rubber is the need of the hour considering the rapid depletion of resources. Used tires are one waste stream worth consideration for recycling. Possibilities for reuse of tire materials are granulate, reclaim or devulcanisate. Devulcanisation is a chemical process; however, the most efficient devulcanisation aids are generally disulphides or mercaptans, which are expensive and have a repellent smell, making them difficult to use on an industrial scale. To develop an environmentally sound and cost-efficient devulcanisation process, different rubber chemicals are compared concerning their devulcanisation efficiency as well as the smell of the devulcanisate.

11:05 - 11:20 - Break

11:20 - **Regenerated rubber**
Hurdon Hooper, director, Rubreco, Canada
The technical and economic benefits of regenerating waste rubber from the tire industry.

Panel Discussion

13:00 - 14:00 - Lunch

DAY 3 *THURSDAY 18 FEBRUARY* SESSION 5

09:00 - 13:00
ADDITIONAL VARIED SUBJECT TECHNICAL PAPERS

09:00 - **Tire modelling through automated software for quick iterations of CAE**
Srinivas Chandupatla, manager - product design & development, CEAT Ltd, INDIA
The presentation will introduce CAE-driven models with a parametric approach that will enable many simulations to be performed with ease, and minor changes to be implemented to reach the optimised stage to deliver a fine-tuned product.

09:25 - **Parametrical approach for modelling tire forces and torques in TMeasy5**
Ronnie Dessort, simulation consultant, TESIS DYNAware GmbH, GERMANY
For the validation of vehicle control systems, real-time capable tire models are required, which allow a simple adjustment of parameters and environmental conditions. An essential characteristic of the model approach is that the parameters can be interpreted physically and that measurements can be reproduced with high accuracy. Bore slip is considered in the combined force calculation affecting the traction potential. Enhancements in the description of the effective contact patch lead to an improved calculation of aligning and overturning torque. A realistic hysteresis behaviour especially for low-speed parking manoeuvres is provided.

09:50 - **Rubber compound additives with improved thermal conductivity and mechanical properties**
David Reynolds, global segment manager, Cabot Corp, USA
Improving thermal conductivity of inherently insulating polymer systems with the use of high thermal conductivity additives is common in electronics applications. However, the adoption of thermally conductive additives in rubber compounds – including those for tire applications – has been slow. Here, we present a new material for improving thermal conductivity in rubber compounds while maintaining reinforcing properties.

10:15 - **Mould cleaning technology 4.0**
Florian Schreiber, director sales tire industry, 4JET Technologies GmbH, GERMANY
Laser mould cleaning is on the rise in the industry. Latest developments in tire design and compounding require highest standards for mould cleaning. The latest technology in laser mould cleaning complies with the demand from the market: best cleaning quality at lowest cost of operation.

10:40 - **Innovative mechatronic drive solutions – conveying and more**
Tobias Nittel, technology field manager, Sew-Eurodrive GmbH & Co KG, GERMANY
The presentation gives an overview of the requirements for energy-efficient drives.

11:05 - 11:20 - Break

11:20 - **TCD module for self-adjusting shearographic tire tester**
Bernward Maehner, software engineer, SDS Systemtechnik GmbH, GERMANY
Utilising a newly developed tire contour detector, a detailed cross section of the tire is measured while entering the shearographic test chamber. Determination of overall width, shoulder width and distance between beads allows individual and precise positioning of the measuring heads without any user interaction.

11:45 - **Inspecting bead filler in 3D using laser profile sensors**
Achim Sonntag, division manager inspection systems, Micro-Epsilon Messtechnik GmbH & Co KG, GERMANY
The verification of dimensional limits is an important step in any extrusion, and in the production of bead filler components. Five laser profile sensors are used to cover the material in cross section, and over the length value one gets a precise 3D mapping of the product.

12:10 - **Retrofit strainer in an existing mixing line**
Dirk Hasse, managing director, Hatec Gear Pumps GmbH & Co KG, Germany
In recent years there have been big investments in new mixing lines. The additional mixing capacity

OPTIONAL SHORT COURSES

4 DAYS
AKRON UNIVERSITY TIRE MECHANICS SHORT COURSE
Date: 15/16/17/18 February 2016
Course fee: €1,475 plus German VAT

The 43rd Tire Mechanics Short Course will be held concurrently with Tire Technology Expo 2016 in Hannover, Germany. This four-day educational and developmental course will provide engineers and scientists with an in-depth, intense study of the latest developments surrounding tire engineering. The course is designed for practising engineers, chemists and scientists who are concerned with tires and vehicles and who have an engineering or science background at the Bachelor of Science level. The basic and practical aspects of the mechanics of pneumatic tires will be introduced by internationally renowned experts in tire mechanics. Over 1,000 pages of course notes on a CD prepared by the instructors will be provided for all participants. Those who complete this course will receive a certificate from the University of Akron.

THIS COURSE SELLS OUT FAST – BOOK NOW!

2 DAYS
TIRE MATHEMATICAL MODELLING COURSE
Date: 15/16 February 2016
COURSE FEE €925 plus German VAT for the two-day course CAN BE BOOKED ON ITS OWN

Tire Mathematical Modelling Course will be held concurrently with Tire Technology Expo 2016 in Hannover, Germany, on 15 and 16 February 2016 – commencing the day before the expo and main conference. This course covers the computer modelling of tires within a full vehicle system. It is aimed at engineers and researchers working in industry or academia. The subject matter will be of primary interest to vehicle dynamicists, for whom the tire is the primary force and moment generation element on the vehicle.

LIMITED PLACES – BOOK NOW!

2 DAYS
BASIC RUBBER COMPOUNDING COURSE
Date: 15/16 February 2016
COURSE FEE €925 plus German VAT for the two-day course CAN BE BOOKED ON ITS OWN

The Basic Rubber Compounding Course will be held concurrently with Tire Technology Expo 2016 in Hannover, Germany, 15 and 16 February 2016 – commencing one day before the expo and main conference. Presented by Bob Kind MIMMM, GPRI, technical director of Polymer Recyclers UK; and John Bowen MIMMM, BSc, consultant formerly of Robinson Bros Chemicals UK. This basic course is designed for all those working in the associated tire industry who wish to know more about the compounding of rubber. It will try to define the concepts in simple terms, but at the same time relate them to actual manufacturing and product circumstances.

LIMITED PLACES – BOOK NOW!

1 DAY
TIRE REGULATIONS SHORT COURSE
Date: 15 February 2016
COURSE FEE €575 plus German VAT for the one-day course
CAN BE BOOKED ON ITS OWN

The Tire Regulations Short Course will be held concurrently with Tire Technology Expo 2016 in Hannover, Germany, on 15 February – the day before the expo and main conference. The course will be delivered by Lars Netsch of TÜV Süd, who has considerable knowledge of the current tire regulations in Europe and beyond. These are particularly critical as tire labelling and new type approval regulations are introduced. Some indication of the future in terms of tire regulations will be discussed, and a brief outlook on the impact on tires of the EU's chemical regulation, REACH, will also be given.

LIMITED PLACES – BOOK NOW!

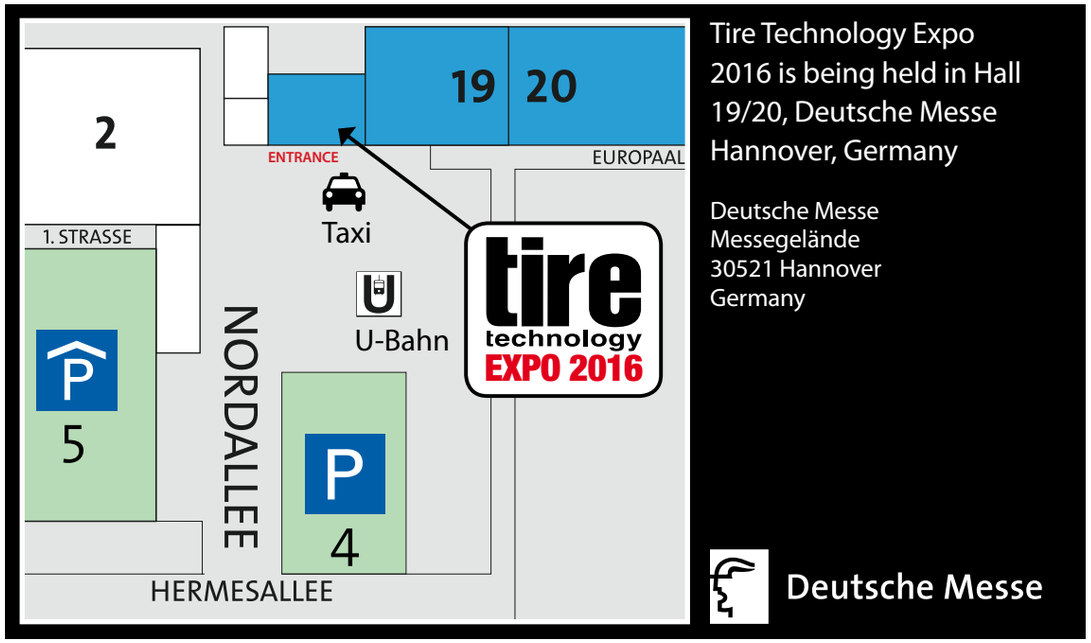
1 DAY
CORDS AND STEEL WIRE: THEIR PROPERTIES AND PERFORMANCE IN TIRES
Date: 15 February 2016
COURSE FEE €575 plus German VAT for the one-day course CAN BE BOOKED ON ITS OWN

Experts from Bekaert, Cordenka and Kordsa will be course chairs.

This course will provide engineers with a thorough grounding in all aspects of cords and steel wire. It will explain how they influence the design and manufacture of the tire. The course will be run by experts who have many years' experience and influence within tire manufacturing.

LIMITED PLACES – BOOK NOW!

TIRE TECHNOLOGY INTERNATIONAL AWARDS



Tire Technology Expo 2016 is being held in Hall 19/20, Deutsche Messe Hannover, Germany

Deutsche Messe
Messegelände
30521 Hannover
Germany

Deutsche Messe

AWARDS FOR INNOVATION AND EXCELLENCE

GALA DINNER AND AWARDS CEREMONY, 17 FEBRUARY 2016

Kuppelsaal, Hannover Congress Centrum,
Theodor-Heuss-Platz 1-3, 30175 Hannover

On the second evening of the exhibition (17 February 2016) there will be an entertainment-packed evening where we will present the Awards for Innovation and Excellence.

Delegates, exhibitors and their guests will have free access to this event.

2015 Awards winners included:
- Tire Manufacturing Innovation of the Year - Tandem mixer – Apollo Vredestein
- Environmental Achievement of the Year - Micronized Rubber Powder – Lehigh Technologies
- Tire Technology of the Year - EverGrip – Michelin
- Tire Industry Supplier of the Year - Versalis (Elastomers business unit)
- Tire Manufacturer of the Year - Michelin
- Lifetime Achievement Awards - Professor Hans Pacejka and Dr Roger Williams
- Young Scientist Prize - Dr Flavio Farroni

THE GLOBAL TIRE DESIGN AND TIRE MANUFACTURING EVENT

2016 EXHIBITOR LIST

CONFIRMED EXHIBITORS TO DATE INCLUDE: 4JET Technologies GmbH • A & D Europe GmbH • AB Svenskt Konstsilke • AFACHE • AIRTEC Controls GmbH • Akron Special Machinery • Akron Steel Fabricators • Albeniz • All India Rubber Industries Association • Allma Volkmann Zweigniederlassung der Saurer Germany GmbH & Co. KG • Alpha Technologies GmbH • Altracon S.A • Ammeraal Beltech Nederland Beheer BV • AP2 - Automazione Processi Produttivi S.r.l. • Applus IDIADA • Aquajet • Arizona Chemical • ASM-Hasbach • Astro-Med GmbH • Avex Steel Products s.r.o. • AXELENT GmbH • Barbe GmbH • Bartell Machinery Ltd • Bartell Machinery Systems LLC • BD Testing Inc • Beckhoff Automation GmbH & Co. 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FOR MORE INFORMATION

Contact: Mark Fenner | UKIP Media & Events | Abinger House | Church Street | Dorking | Surrey | RH4 1DF | UK |
Tel: +44 1306 743744 | Fax: +44 1306 877411
Email: mark.fenner@ukipme.com | **www.tiretechnology-expo.com**