

Lightweight materials for automotive applications: Fundamentals, recent developments and challenges in manufacturing

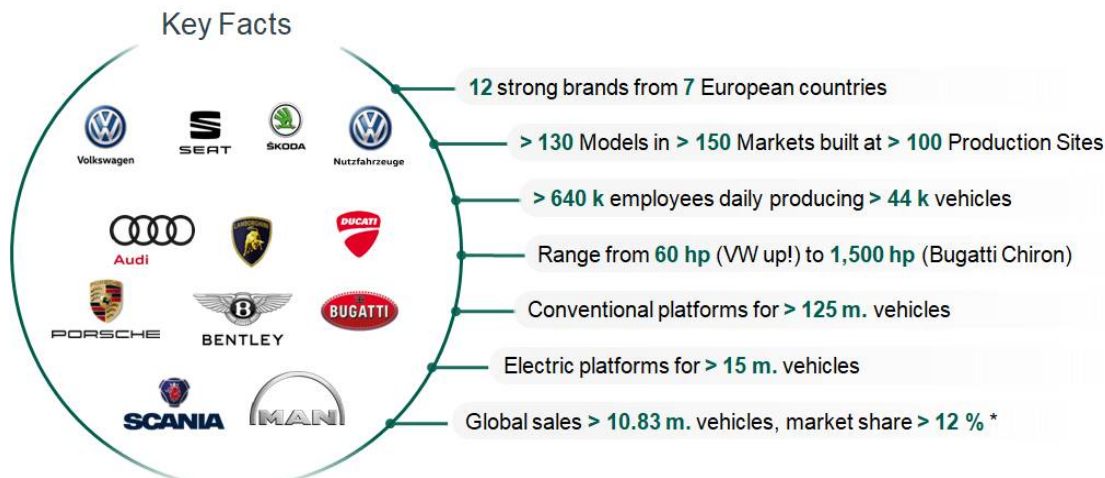
Overview

A 10% reduction in vehicle weight can result in a 3 – 10 % improvement in vehicle performance and hence lightweight materials are becoming essential to improve the energy efficiency of modern automobiles (including battery-operated vehicles) while maintaining safety and performance. Therefore, the use of lightweight materials becomes one of the major future directions for the automotive industry globally. New innovations in sheet metal have been a pioneer in reducing the weight of body-in-white (BIW) and at the same time in fulfilling all crash requirements. Keeping in view the significant need for this domain, the main objective of this course is to understand innovations in lightweight materials for automobile applications in terms of materials characteristics and its manufacturing issues.

Joining and fabrication techniques for new, lighter, and stronger materials also play a crucial role in augmenting the present manufacturing for new generation vehicles. Furthermore, a multi-material lightweight design strategy in which both advanced high strength steel and low-density alloys are used is becoming a novel approach towards environmentally sustainable transport. The Need of metallurgical considerations and various challenges for joining of lightweight structures will also be discussed which may provide a new direction of the research.

About Volkswagen

For value addition as well as to strengthen the course content, the foreign expert is from Volkswagen, Germany, a leading automobile manufacturing industry. Volkswagen was the world's largest automaker by sales, overtaking Toyota and keeping this title in 2017, 2018, and 2019. It ranked seventh in the 2018 Fortune Global 500 list of the world's largest companies. Some of the highlighted features about the Volkswagen Group are presented in graphical view to get its immediate attention:



Overall, efforts will be made to deliver the most recent industry-oriented knowledge with the participants in terms of the need for lightweight materials, ongoing developments and associated challenges with the manufacturing of automotive components. Additionally, an attempt will also be made to invite renowned experts from leading Indian automakers and allied industries to interact and enrich the knowledge of participants by discussing the present scenario and opportunities in manufacturing automobile structures using lightweight materials.

Objectives:

The primary objectives of the course are:

1. Exposing participants to the fundamentals and requirements of lightweight structures for new generation automobiles.
2. Building in confidence and capability amongst the participants towards the application of lightweight materials, innovative forming, and joining technologies which will be the need for future manufacturing industries and researchers.
3. Providing exposure to design for manufacturing by presenting problems in the manufacturing of lightweight structures and their solutions through simulation tools.
4. Enhancing the capability of the participants to understand challenges in forming and joining of lightweight materials as well as dissimilar materials.
5. Providing exposure to practical problems and their solutions through case studies and tutorials/hands-on practice.

Course information	Duration: 22 – 26 March 2021 (05 days) Total contact hours: Minimum 20 (Including lectures and hands-on) The number of participants for the course will be limited to 50.
Modules	<ul style="list-style-type: none"> ▪ Introduction to the new Era of E-Mobility and lightweight automobiles ▪ New trends in sheet metal forming/joining and innovations in materials and tooling to form lightweight structure. ▪ Innovations in non-ferrous materials to form a lightweight structures ▪ Optimum material mix for light and economical BIW ▪ Importance of design for manufacturing and fundamentals of joining technologies to fabricate a lightweight structure. ▪ Process planning to stamp high complex outer body part, clamping design, case studies for feasibility analysis and to narrate the use of simulation tools, etc. ▪ New innovations in welding and joining technologies to join lightweight structure, significance of testing of structures. ▪ Issues need to be considered during manufacture of BIW including the effectiveness of energy management.
You should attend if...	<ul style="list-style-type: none"> ▪ You are student (B.Tech/M.Tech/Ph.D) or faculty/staff member from Mechanical/ Production/ Automobile/ Metallurgy or allied Departments. ▪ You are a manager, engineer, supervisor, officer, or researcher from industry/Govt. organizations including R&D laboratories.
Course fee	<ul style="list-style-type: none"> ▪ Industry/Govt./Research organizations: Rs. 4,000/- ▪ Faculty/staff from academic institutions: Rs. 3,000/- ▪ Research scholars/Students: Rs. 2,000/- <p>Additional 18% GST (or as applicable at the time of registration) as per Govt. of India norms. No TA/DA will be paid to any participants. Only working lunch and tea will be provided during the course. Participants will have to make their own stay arrangements during the course duration. Limited accommodation may be made available to the interested participants in the institute guest house/hostel on a self-payment basis, subjected to availability.</p>

The Faculty



Dr. Kartik is having reach experience of more than 25 years in various world-renowned organizations out of which 12 years with Volkswagen AG in Germany. The Volkswagen group is a strong global player successfully transforming itself from IC Engine to E-Mobility era. Before he started with battery development 2 years back, he was involved with the development of body-in-white vehicles. He has handled many Projects for VW Group in the area of stamping and welding of advanced grades of sheet metal parts. He was responsible for the beginning phase starting with a feasibility analysis of body-in-white till the last stage of production. In his role as product readiness manager, he had to work closely with the development team, tool makers from all over the world, design and purchase department to see that the right quality products are delivered in right time.

He completed his PhD from the University of Stuttgart in Germany. During his PhD, he was involved deeply in improving manufacturing processes like a sheet and bulk metal forming and validating it with finite element method (FEM) based simulation. After his PhD, he worked with Autoform, which develops simulation software for the stamping process. Later he involved himself in areas like the design for manufacturing and tooling design. In addition to his expertise in the area of manufacturing processes like metal forming and welding, he did additional specialization in the field of battery technology, an electric motor, and lightweight structures. From the last three years he is giving regular lectures in the area of continuum mechanics, E-Mobility and battery production in various international forums including IIT Bombay, Mumbai.

In his present work, he is responsible for developing a new production process. He has developed 12 patents, which involve the production of batteries more effectively and economically. He is pleased to share his knowledge and expertise in the area of lightweight, innovations in manufacturing process (stamping and welding) and development of automobile body-in-white (with special emphasis to E-Car) to researchers, faculties, and industries.



Dr. Vivek Kalyankar is presently serving as Assistant Professor in the Mechanical Engineering Department at S. V. National Institute of Technology (SVNIT), Surat, Gujarat, India, which is an Institution of National Importance. He is having around 18 years of professional experience which involves the blend of academics, research, and industry experience. His research interest mainly includes the weldability of advanced grades of materials and the implementation of optimization techniques. He was instrumental in developing an advanced welding laboratory in the department which consists of state of the art research facilities. He developed good networks with surrounding industries of the field and involved in attempting various industry-based projects through research on their ongoing materials. He is a co-author of several International articles and also acting as a reviewer to various reputed International Journals. He is a recipient of the 'Young Engineer Award in Mechanical Engineering Discipline' in 2014-2015 given by Institution of Engineers (India).



Dr. Mukund H. Bade started his teaching carrier in 2000 after completion of Master in Power Engineering. He worked in various Institute of University of Mumbai, including Sardar Patel College of Engineering, Mumbai for nearly 4 years. Since 2007, he is working as Assistant Professor in the Mechanical Engineering Department, Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat. He completed his PhD from Indian Institute of Technology Bombay, Mumbai, India in 2014. In addition to teaching, he is also involving himself in research activity and support institute in administrative works. His research interest is energy management of various systems, thermal and fluid engineering, and micro-hydro power plants. He also handles projects related to energy management along with the research group and has a good number of research publications in reputed international journals and conferences. In short, he loves to research and enjoys touching the heart of young minds and inspiring through teaching. He also makes himself busy in spiritual activity and having life membership of Scientists and Engineers Wing of Rajyoga Foundation. His hobbies are walking, exercise, and meditation.

Mode of Registration:

All prospective participants need to do web registration for this course through GIAN (<http://www.gian.iitkgp.ac.in/GREGN>) portal. After the mandatory web registration, participants should share the registration details with the course coordinator by email (vivekkalyankar@yahoo.co.in)

The shortlisted participants will be informed by email to register for the course by making full payment of the course registration fee.

Course coordinators

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