

Technical Talks on “Lightweight & Smart Materials to reduce Fuel Consumption in Cars, Trucks, Railways & 2-Wheelers” and “Technology Transfer in Defence Sector”

Two technical talks on “*Lightweight & Smart materials to reduce Fuel Consumption in Cars, Trucks, Railways & 2-Wheelers*” and “*Technology Transfer in Defence Sector*” were organised at Delhi Chapter on 10 Feb.2018.



At the outset Shri K L Mehrotra, Chairman IIM Delhi Chapter welcomed the Speakers – Prof. Pradeep K Rohatgi, *Distinguished Professor & Director - Centre for Composites & Advanced Materials, University of Wisconsin, Milwaukee USA*; Maj.Gen. (retd.) R C Suri *formerly in Corps of Electrical & Mechanical Engineers, Indian Army* and others present in the gathering. He gave brief details about the activities of Indian Institute of Metals and its Delhi Chapter.

First he introduced the speaker, Prof. Pradeep K Rohatgi and the floor was handed over to Prof. Rohatgi for his presentation.



Prof. Pradeep K Rohatgi, during his detailed presentation focussed on global trend in continuous reduction of weight of Vehicles, owing to emphasis on CO₂ reduction and Fuel Efficiency. This has resulted in increased usage of high strength steels, Aluminium, Magnesium & Composites. He highlighted that the possibility of weight reduction is upto 60% by use of composites as compared to other measures (which result in weight reduction between 10 – 50%).

He introduced MMC (Metal Matrix Composites) and their applications. He compared microstructures of different Composites developed by Univ. of Wisconsin-Milwaukee, Comalco and Duracon. The different applications of MMC have been in Aerospace Industry (*discontinuous & continuous composites in F-16 fighter jets; Al/Gr antenna waveguide in Hubble telescope, different components in planes, helicopters & Shuttle orbiter etc.*); in Automotives (*Cylinder liners in Autos & Motor Cycles, automotive brake rotors, Intake & Exhaust valve in Toyota Alteza, brake components in Rail applications, drive shafts for trucks & automotives, etc.*); brake applications in a number of cars & high speed rail trains and various applications in Toyota Cars (*Disc brake rotor, electronics cooling plate, crankshaft pulley, Cylinder liners etc.*).

He mentioned about Syntactic Foams (hollow sphere MMC & with gas-filled pores) having high impact energy absorption capabilities.

He introduced Nanocomposites as reducing grain size to nanoscale significantly enhances strength in most metals & alloys. In space shuttle applications, use of Nanocomposites have resulted in weight reduction upto 50% as compared to use of conventional composite materials.

Prof. Rohatgi also mentioned about work on Self-healing, self-lubricating and self-cleaning materials for prevention of drastic failures during operation. Intelligent composites were also touched upon.

The available facilities at Univ. of Wisconsin-Milwaukee Composite Centre as well as development of various composites were also discussed.

While concluding his presentation, Prof. Rohatgi emphasised that

- Metal Matrix Microcomposites can help reduce the weight while increasing the energy absorbing capability of transportation systems
- While Polymer nanoclay nanocomposites have received considerable attention, the work on Metal Matrix Nanocomposites is in its infancy
- Powder metallurgy, cryomilling, solidification processing have been successfully used to incorporate nanosize particles including carbon nanotubes in metal matrices
- Exceptionally large increases in strength, hardness and wear resistance and reduction in friction coefficient have been obtained as a result of incorporation of very small volume percentages of nanoparticles in matrices of metals
- Self-healing materials being developed at UWM can increase the survivability of Military Transportation Systems
- Self-lubrication Metal Matrix Composites can decrease energy consumption and increase the reliability of Military Transportation Systems
- Self-cleaning composites can be synthesized which can increase the performance of military vehicles

Prof. Rohatgi's presentation was supported by suitable visuals.

Mr K L Mehrotra then introduced the second speaker, Maj.Gen. (retd.) R C Suri and the floor was handed over to Maj. Gen. Suri for his presentation.

Maj. Gen. (retd.) R C Suri, during his detailed presentation highlighted significant Technology Transfer cases in Indian defence Sector.



He highlighted the dominant role played by the technology in modern warfare. He stated that the oft-repeated cliché that man behind the weapon determines the ultimate fate of war is being reconsidered as all new discoveries of cutting edge technologies find their first application in military weapons. These cutting edge technologies act as a force multiplier and go a long way in ultimate success in the battlefield.



It was informed that after nearly seventy years of freedom, India still is one of the highest importer of arms in the world. Recently with a new found focus on 'Make in India' campaign, involvement of civil industry in defence manufacturing is giving encouraging results. Giving examples of Transfer of Technology from defence agencies to Industry, he mentioned the notable role of several industrial houses in coming to support HAL's effort to augment the production rate of Light Combat Aircraft (LCA) - Tejas. Similarly another production house is actively participating with Brahmos Aerospace in manufacture of air frame of Brahmos cruise missile. It was mentioned that more recently, two more production houses viz, Tata Power and Bharat Forge have successfully manufactured prototypes of 155mm Advances Towed Artillery Gun System with transfer of technology from DRDO. These initial steps will go a long way in developing a viable Military Industrial Complex in the country.



Notwithstanding above successes, we still have a long way to go in attaining adequate self sufficiency in several critical technologies. In this regard he mentioned that we are totally dependent on imports for propulsion units for aircrafts, tanks or battleships. For this he suggested the need to involve academia, besides the production houses, to create the centres of excellence in such areas. As a way forward, he suggested that important gaps in design technologies need to be identified by DRDO and steps taken as national missions attaining the self-sufficiencies with active participation of all concerned.

Both the presentations evoked lively interaction amongst the speakers and audience. There were a number of queries during the Presentations

The presentation by Prof. Rohatgi and Maj Gen (Retd) R C Suri were attended by about 30 IIM DC members.

The audience found the presentations very interesting and informative.

Chairman, proposed Vote of thanks to both the Speakers.



As a token of appreciation, mementos were presented to both the Speakers by Chairman.

The programme concluded with lunch.