

# Fibre Reinforced Polymer Composites Opportunities for Now and Future

By

Dr. Chaitanya Shah  
(Mechemco Group)

# Today's Journey

- Current Scenario
- Opportunities in Applications
- Opportunities with New Materials
- Opportunities with New Production Technologies
- Opportunities and Need for Skill Development
- Action Points to Follow
- Team Work for Global Reach
- Q & A

# Indian Composites Business - An Opportunity to Grow

- We are the World's Largest Democracy with Government Pitching in for "Make in India" and "Aatma Nirbhar Bharat" Initiative in All Essential Sectors
- India would be the Most Densely Populated Country in the World with Projected Population Increase of 38% from 2010 by 2050 with Highest % of Population in the Working Age Group
- Expect to Rise in Urbanization from ~ 37% in 2010 to ~ 68% by 2050
- Per Capita Income is Bound to Increase from \$5 in 2010 (~ \$8 in 2020) to \$45 by 2050

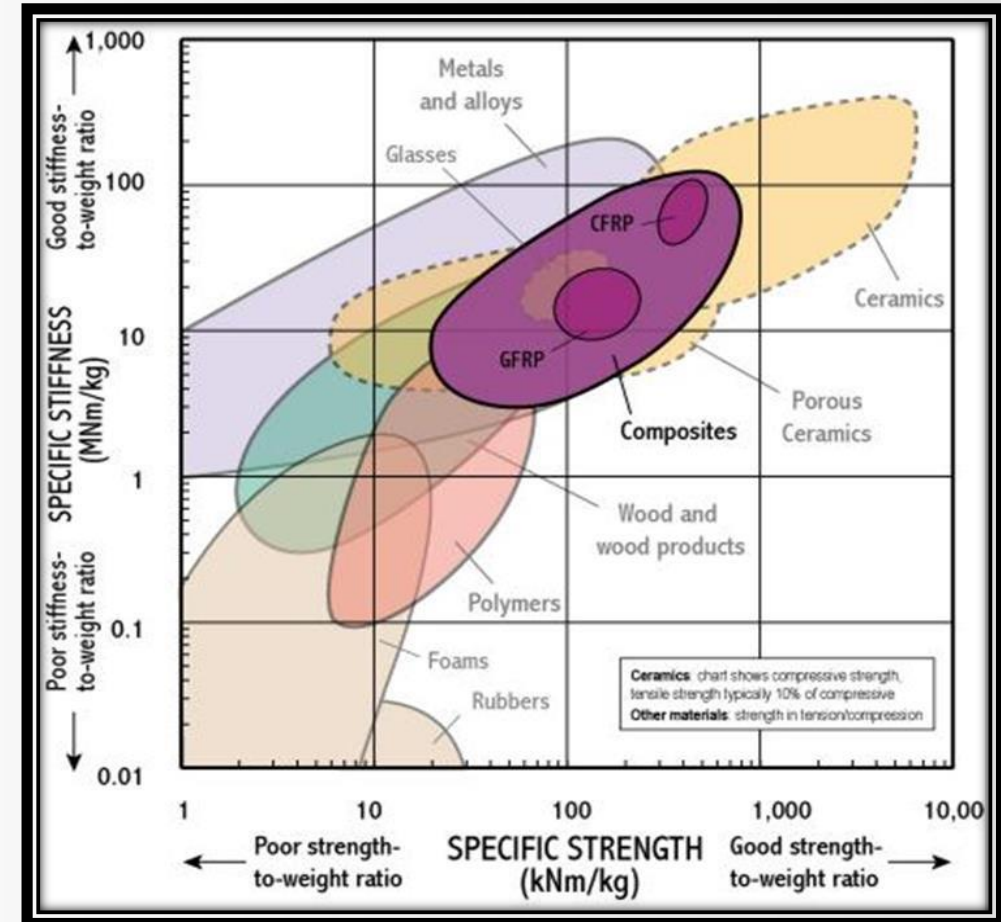
# Need of the Hour

- Better Resource Management is Required for Water, Food & Shelter, Energy for Sustainable Economic Growth
- Energy Efficient Transport Systems for Growing Urbanization would be a Big Challenge
- Important to keep up the pace of Innovation and Development to match with the Growth of Population



# Fibre Reinforced Polymer Composites

- A Wonderful Material of Construction with Tailored Properties and Designed to Provide Long Term Service
- It is used in place of traditionally used Structural Materials, viz., Metals like, Steel & Aluminum; Wood; Concrete; etc.



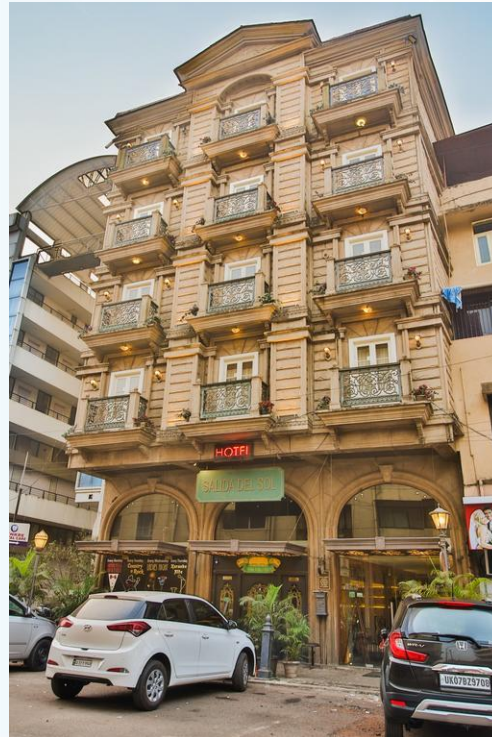
# Versatile in Nature & Abundance of Benefits

- Light Weight with Optimum Stiffness and Specific Performance Properties
- Moldable as Single Piece for a Complex Shape and Size
- Corrosion and Weather Resistant
- Easy to Tailor Design and Manufacture
- Built in Excellent Aesthetics and Performance
- Easy Repair and Maintenance
- Excellent Returns on Investment
- No Chance of Pilferage or Theft (No Resale Value)

# Opportunities for Applications

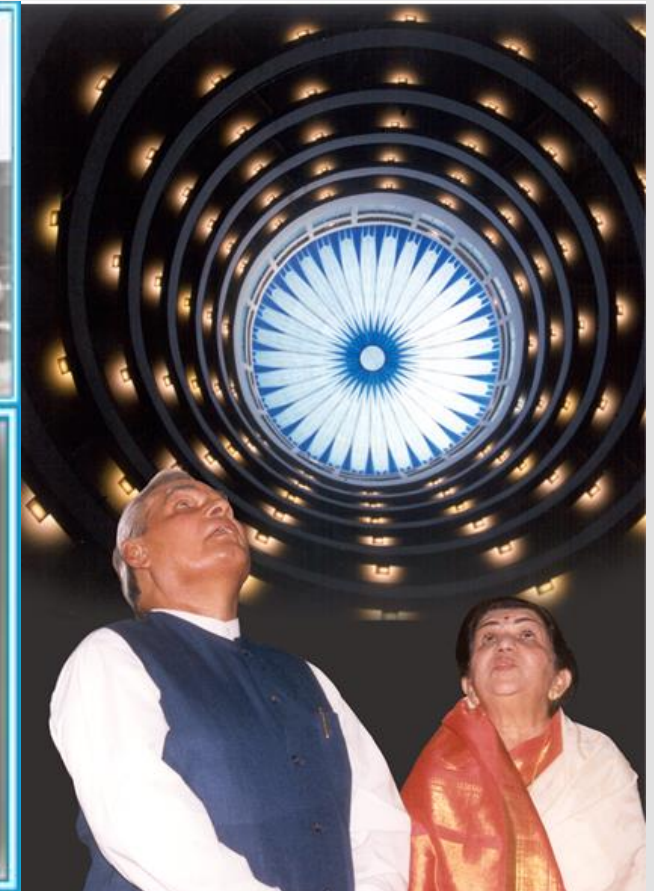
- Building and Construction
  - Façade and Claddings
  - Domes and Skylights
  - Structural Reinforcement (Re-bars and Shuttering Plates)
  - Shuttering and Support Structures
  - Repair and Re-furbishing
  - Doors and Window
  - Modular Housing and many more..

# Facades and Claddings





# Domes and Skylight



SELF SUPPORTING MODULAR FRP VAULT SKYLIGHT  
Span : 6 meters Length : 14 meters  
CREATED BY Mr. MILIND UPASANI  
PROPRIETOR : INDUSTRIAL & COMMERCIAL ENTERPRISES  
FOR JALAN CONSTRUCTION GROUP PUNE.

# Modular Cabins and House





# Re-bars and Mesh Elements





- Structural Repairs



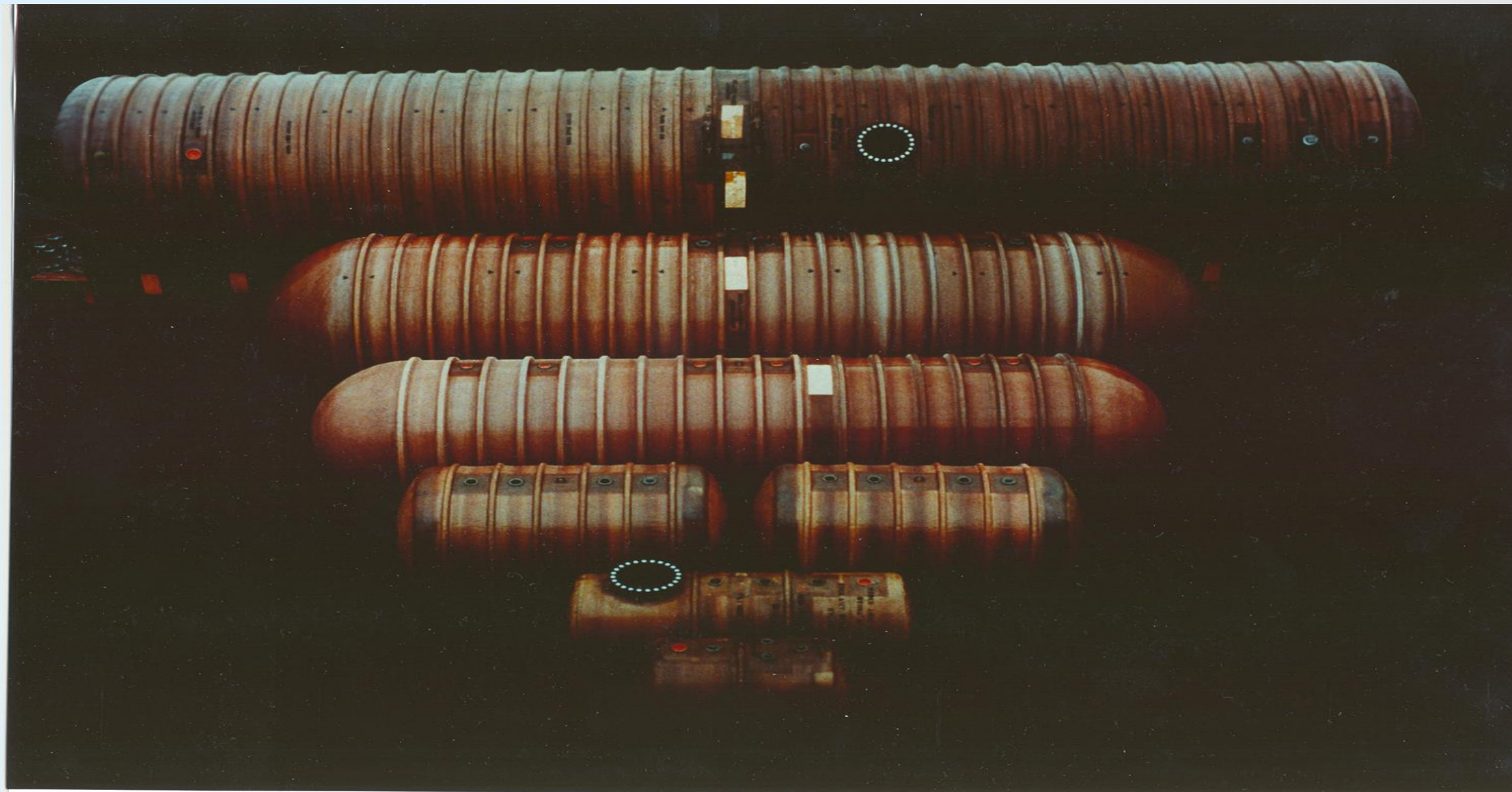


# Opportunities for Applications

- Chemical Industry
  - Process Equipment and Accessories
  - Support Structures and Ancillaries
  - Storage Tanks and Process Piping, Ancillaries
  - Environmental Pollution Control Equipment and Ancillaries
  - Water and Gas Services at High Temperature
  - Off-shore and On-shore Applications
  - Etc..



- Piping
- Structural components
- Siding













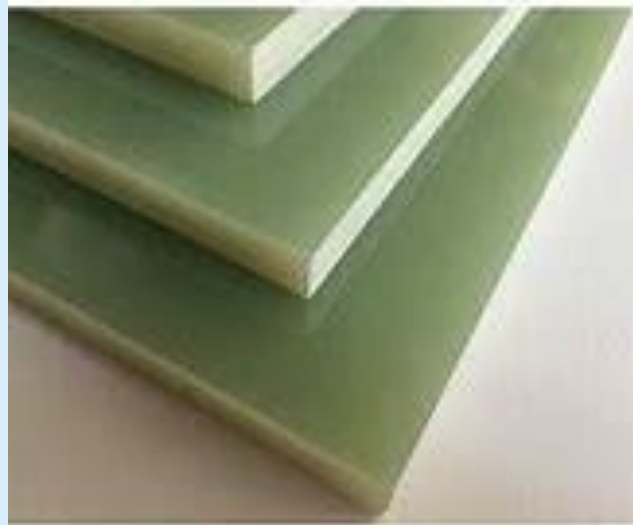


Wet Gas Cleaning  
Connection Line 1 and Line 2  
29.04.2002

# Opportunities for Applications

- Electrical Industry
  - Insulators and Bus Bar Supports
  - Control Panel Board and Instrumentation Boards
  - Junction Boxes and Control Panel Boxes
  - Anti-Static and Conducting Systems
  - Electronic and Electrical Enclosures and Packing Systems
  - Telecommunication Radom and Enclosures
  - Signal Systems and Transmission Line Towers
  - Electrically Non-conductive to Semi-conductive to Highly Conductive Systems







# Opportunities for Applications

- Sports and Leisure
  - Amusement Parks and Water Parks
  - Bicycles and Tricycles
  - Kids Entertainment
  - Golf Carts and Golf Clubs
  - Hockey Sticks, Badminton and Tennis Requisites
  - Cricket Bats
  - Marine Sports Equipment
  - Campers and Camping Shelters
  - Beach Houses and Cabins









# Opportunities for Applications

- Automotive and Mass Transport
  - Vehicle Body (Chassis, Panels)
  - E-Vehicles
  - Bus Body Panels and Engine Hoods
  - Entire Bus Structure (Modular)
  - Locomotive Front End and Driver's Desk
  - Railway Interiors (Seats, Partition Panels, Cladding Panels)
  - Metro Rail (Signage, 3<sup>rd</sup> Rail Cover, Coach Interior, Driver Desk and Cabin)
  - Railway Slippers and Components
  - Structural Components on Rail Over Bridges and Road Over Bridges



















# Opportunities for Applications

- Marine Industry
  - Underwater and Off-shore Applications
  - Coast Guard Patrolling Boats, Fishing Boats, High Speed Crafts, House Boats
  - Luxury Yachts
  - Naval Crafts (including Submarines) Applications ,viz., Sonar Dome, Submarine Batteries etc.
  - Storage Boxes, Buoys and Standalone Structures in Marine Environment

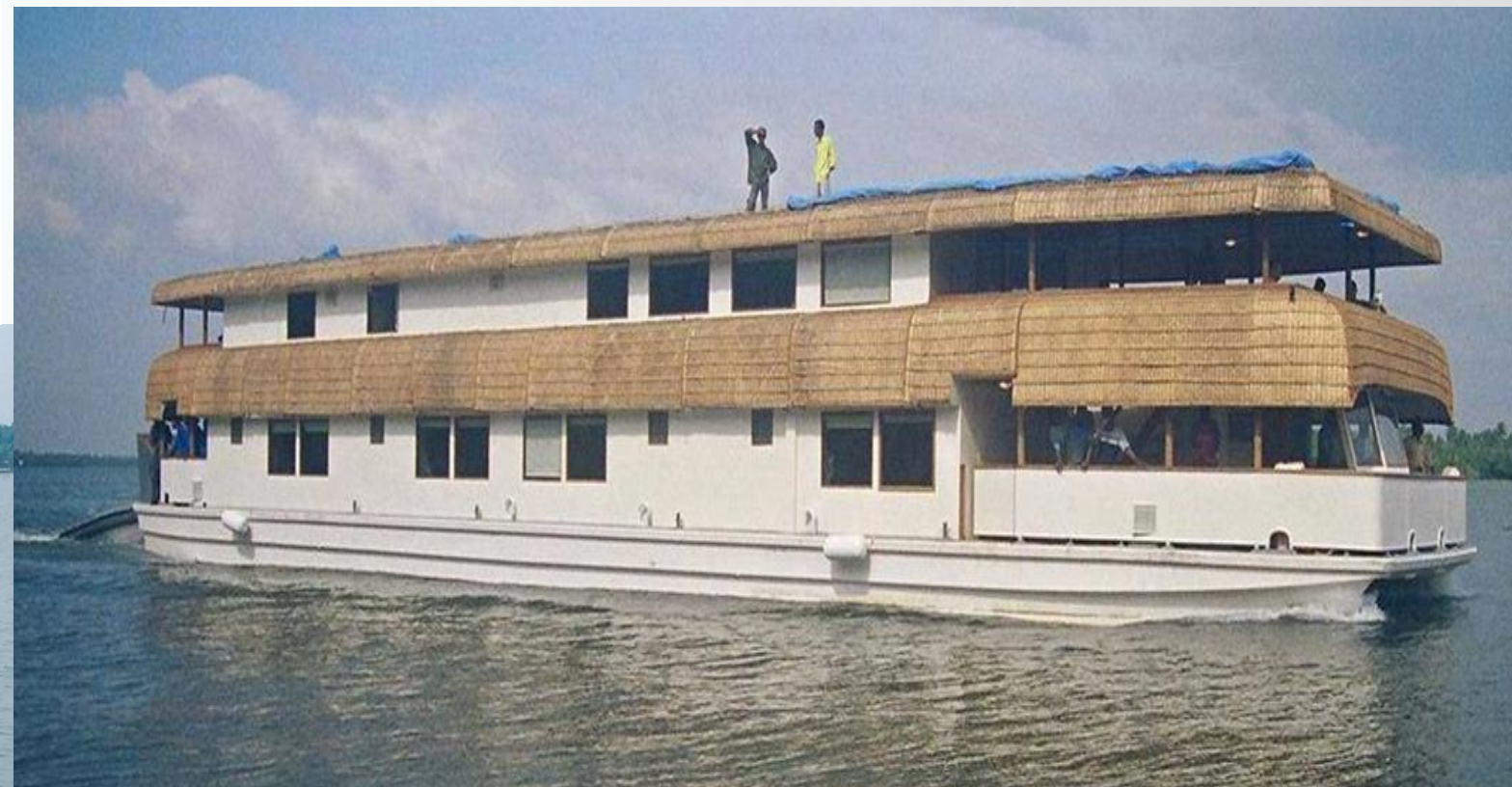












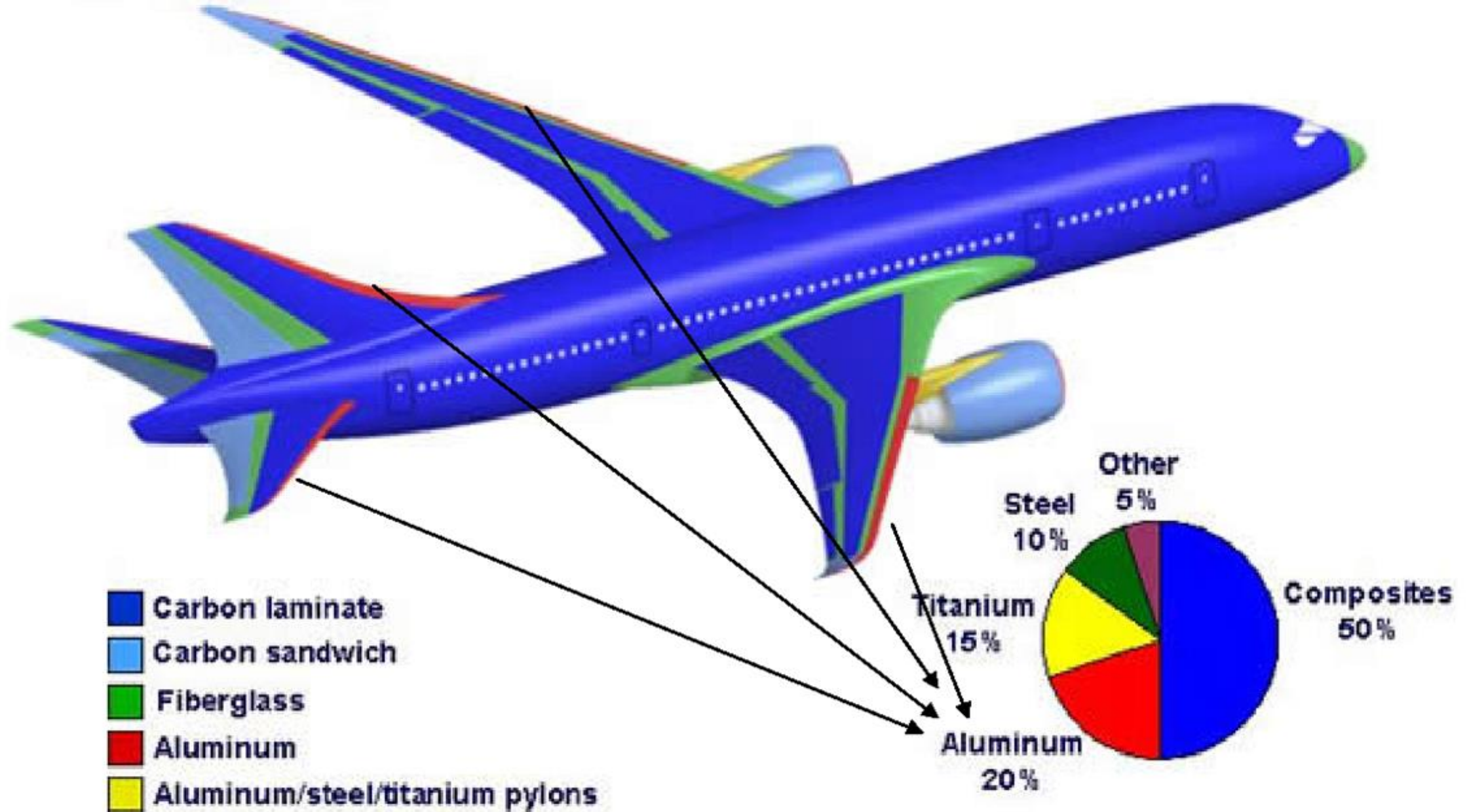
# Opportunities for Applications

- Aerospace and Defence
  - Launch Vehicles and Engine Casings
  - Missile Castings and Domes
  - Tank Armours, Armoured Vehicles
  - Bulletproof Helmets and Jackets
  - Explosion Proof Bunkers
  - High Altitude Bunkers and Shelters
  - Mobile Modular Bridges and Crossovers
  - Etc...











# Opportunities for Applications

- Infrastructure
  - Overbridges, Highway Dividers and Margin Markers
  - Sound Barriers and Crash Barriers
  - FRP Re-bars and Pre-stressed Concrete Castings
  - Water and Sewage Transport
  - Oil and Gas Transport for On-shore and Off-shore
  - Repair and Rehabilitation of Infrastructure (Bridges, ROBs, Pedestrian Walkways, Old Buildings and Heritage Structures etc.)
  - Construction Accessories for Check Dams and Sluice Gates
  - Etc...







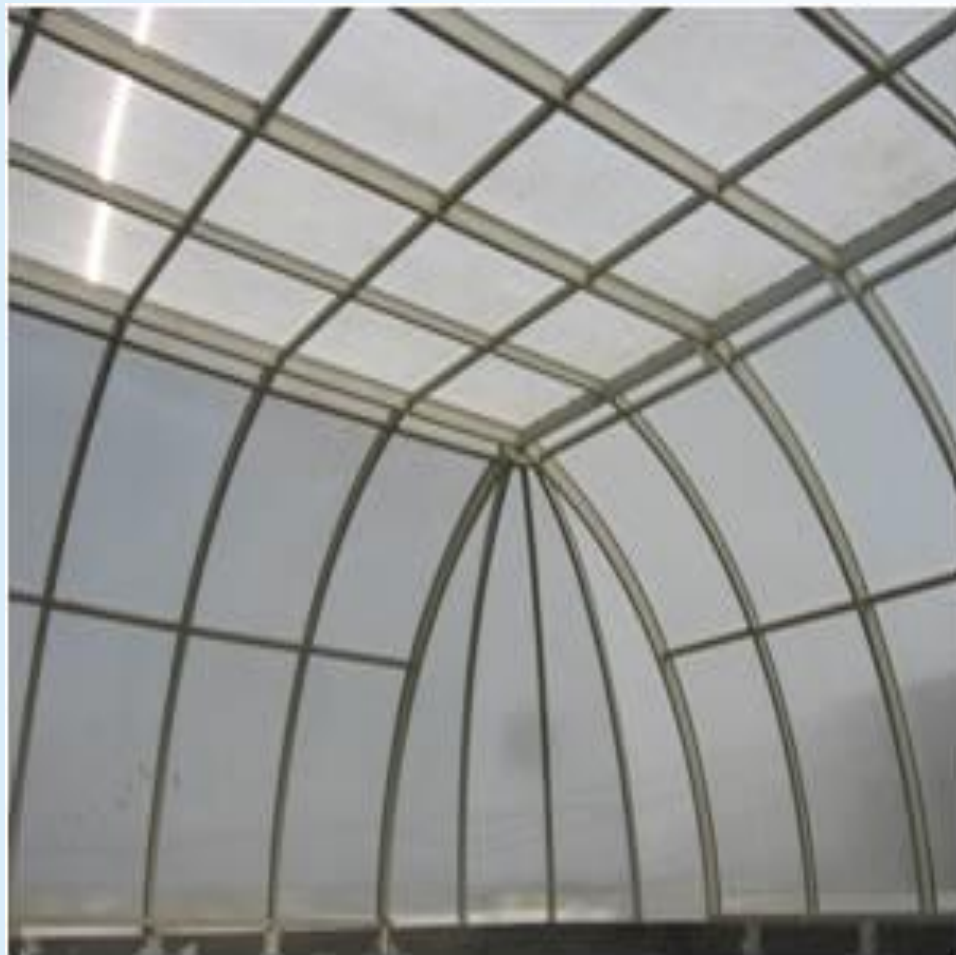






# Opportunities for Applications

- Agriculture, Horticulture, Aquaculture
  - Storage Silos
  - Farming Equipment
  - Cold Storage and Refrigerated Transport
  - Farm House
  - Modular Structures for Green House and Climate Control Systems
  - Fish and Prawn Farming
  - Etc..











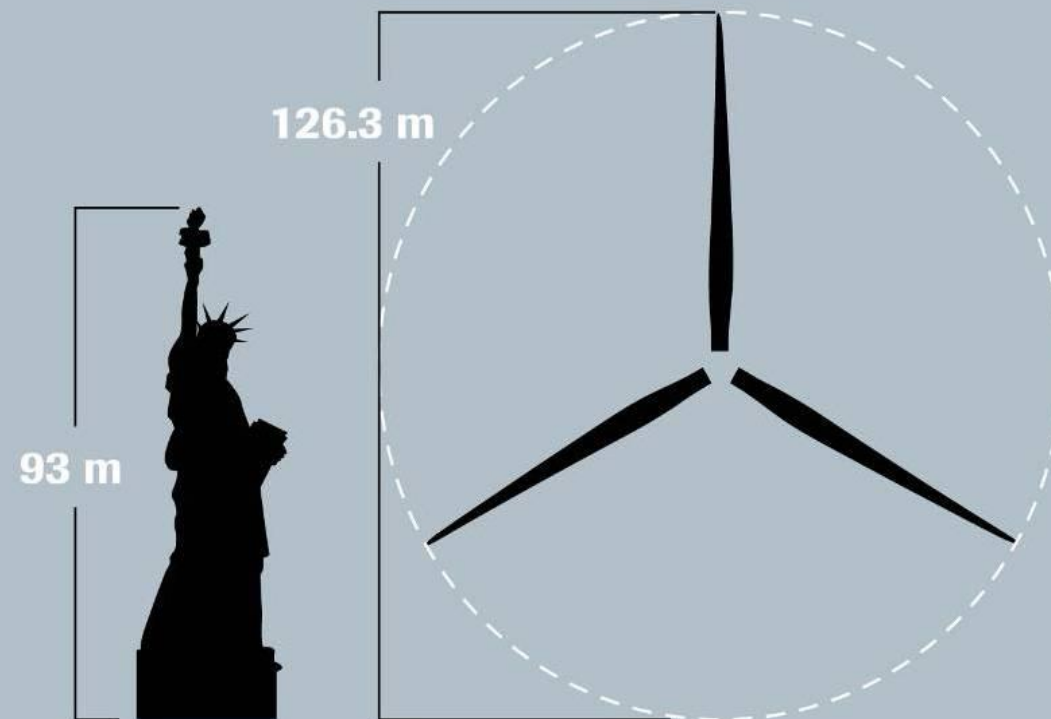
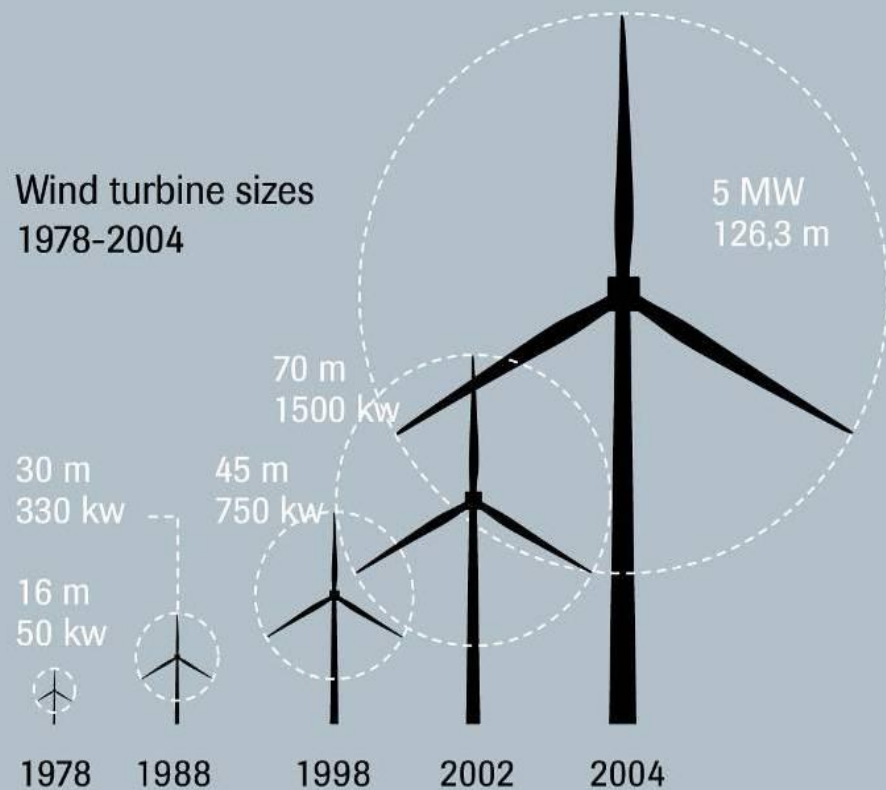
# Opportunities for Applications

- Renewable Energy
  - Wind Energy – Blades and Nacelle Covers
  - Solar Energy – Support and Holding Structures for Solar Cell / Solar Batteries
  - Hydel Power and Tidal Power – Underwater Power Generator
  - Hybrid Wind-Solar Energy
  - Etc..





Wind turbine sizes  
1978-2004







# Opportunity for New Materials

- Resin Matrix Materials
  - New Chemistries and Methods of Processing
    - DCPD RIM, Hybrid Resin Systems
  - Low VOC Emission, Fast Curing and Forming Cycles
  - High Glass Transition, Low FST
  - High Fatigue Life Endurance in All Weather Conditions
  - Reusable and Recyclable, Regenerated

# Opportunity for New Materials

- Reinforcement Materials
  - New Generation of Reinforcements with New Chemistries
    - High Temperature Stable, High Modulus
    - Better Costs and High Volume Production
  - Bio Source and Natural Fibres
    - Improved Carbon Footprint
  - New Surface Chemistry and Modifiers, Hybrid Versions
    - Better Fatigue Resistance and Tailored Properties
- Additives and Modifiers
  - Nano Additives, Stabilizers, Flame Retardants,
  - Ease in Processing and Enhancing Performance Properties



# Opportunity for New Materials

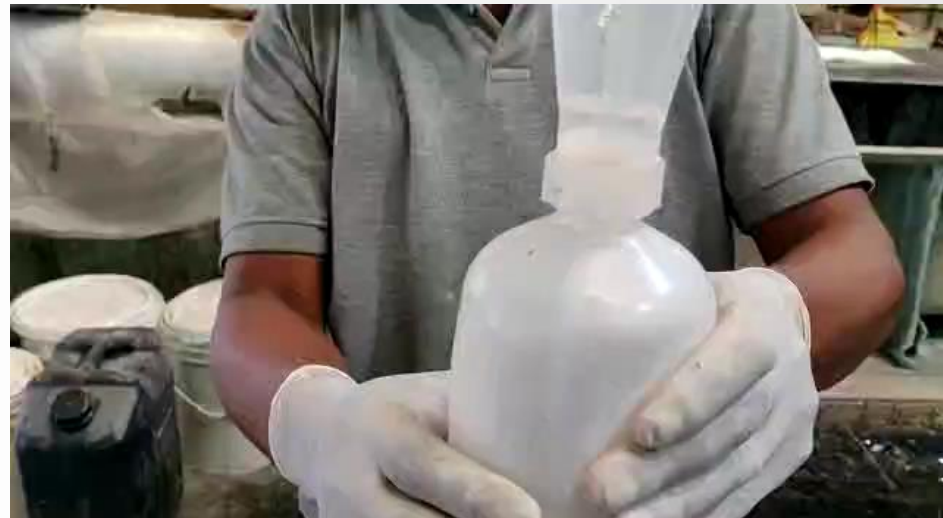
- Additives and Modifiers
  - Nano Additives, Stabilizers, Flame Retardants,
  - Ease in Processing and Enhancing Performance Properties
  - Tailored Improvement and Targeted Performance in Existing Products
  - Better Value Addition at Lower Costs
  - Faster to Market

# Opportunities for Upgrades in Production Technologies

- Spray-up (Manual / Automated)
- Resin Transfer Molding (HPRTM / RTM / LRTM / VRTM / ULRTM)
- Infusion Molding
- Compression Molding (SMC / DMC / BMC)
- Filament Winding (Helical, Continuous, Centrifugal Winding)
- Centrifugal Casting
- Pultrusion
- 3D Printing
- IOT and Industry 4.0 Standard



# Comparison of Brush vs Roller



# Gel Coat Spray and Chop Spray



Flat Panel Spray-up



Complex Mold Spray-up



# RTM and LRTM Process



# RTM – Molding







**Automotive**



**Truck**



**Bus**



**Industrial**

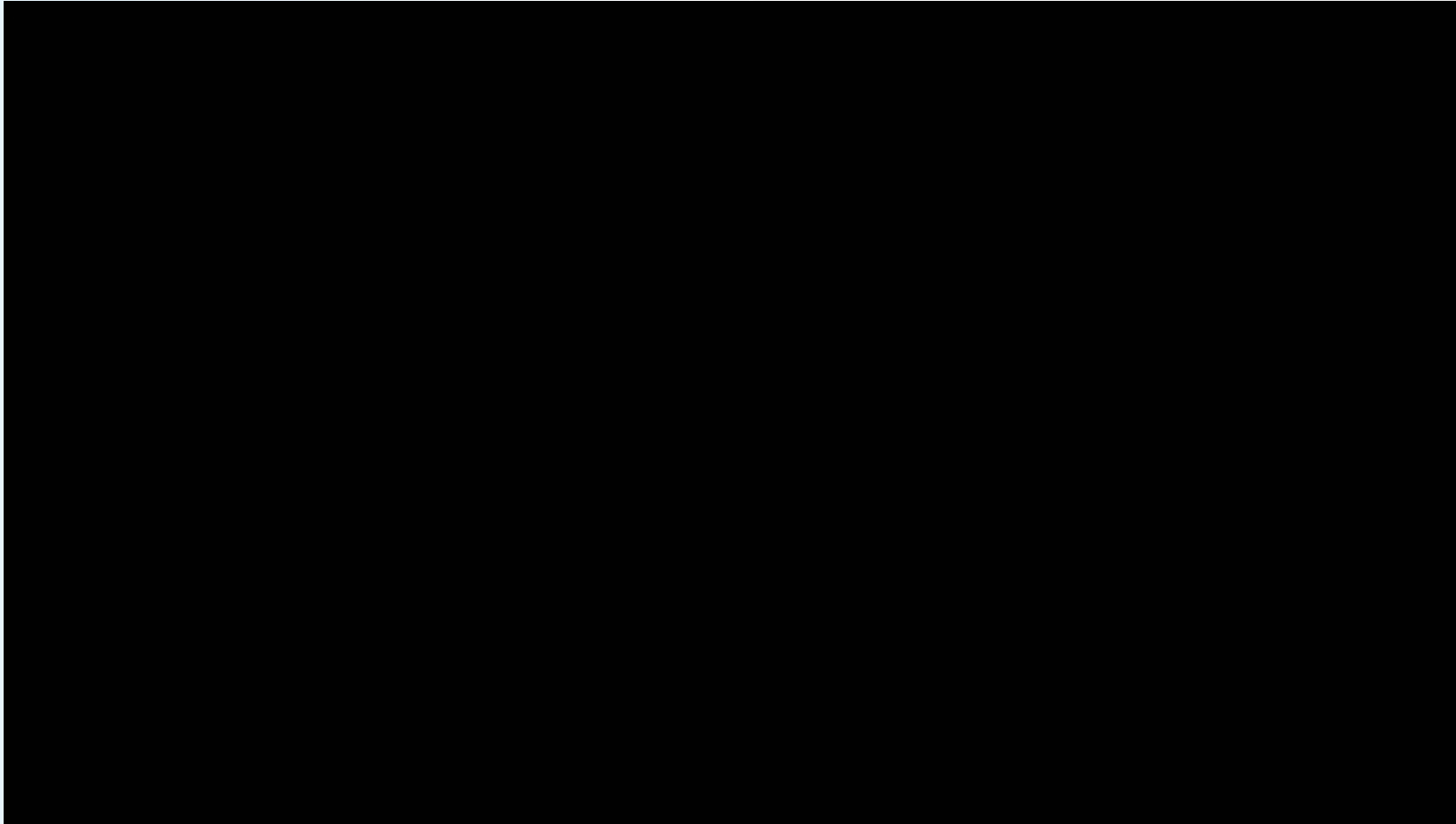


**Boat**



**Recreation**

# UltraLight RTM Process





# UltraLite RTM (ULRTM)



# Switching to Robotics

## How It Works





# 3D Printing in Action for Sports Car Production

# Opportunity and Need for Skill Development and Training

Utmost Urgent Need to Create Needed Skilled Manpower to keep up the pace with developments related to:

- Materials Technology
- Design Technology
- Process Technology
- Quality Control
- Research and Development
- Compliance Monitoring
- Enforcing Regulatory System



# Action Points to Follow: For Sustainable Successful Composites Business

Innovation -> Upgrades -> Updates

With a strategy to

Standardize -> Monitor -> Enforce & Regulate

# Action Points to Follow:

## Let us Get Progressive with FRP as Winning Formula

- Evaluate & Evolve, Ideate and Innovate, Create and Validate, Adopt and Grow
- Work as a Team with All the Stake Holders in the Value Chain – right from Concept Designer to Actual User
- Create and Adhere to a Well Defined System across the whole Value Chain to Ensure Value for Money at every level for Quality and Consistency
- Across the Value Chain, Adopt Robust Practices for On-going Continuous Improvement
- Grow with the Spirit of Ownership and Accountability at Every Level of Operations for each Stake Holder in the Project



# Global Reach for Indian Composites Business

Adopt Strategy of 4R's for Sustainable Growth for Composites Business Right from Conceptualization to Design to End of Life Cycle

- **REFUSE** Poor Quality and Poor Choice of Materials
- **REDUCE** Wastage in Material, Energy and Labour
- **REUSE** Materials and Energy in different forms to adopt with the resources available
- **RECYCLE** the End of Life materials suitably for Conversion to Energy / Co-processing or use in alternative form for Different Application



# Innovate and Upgrade to Achieve Standardization





Thank You

-  Demonstrations & Training
-  Prototype Development
-  Testing & Evaluations
-  Consultancy for Composite Manufacturing Shop



*Our Associates*



## HEAD QUARTERS

### ADDRESS:

Royal ThermoSet Pvt. Ltd.  
C-480, TTC MIDC Area, Pawne  
Navi Mumbai 400701

### TEL. :

+ 91-22-2762 2449 / 2761 6858

FAX NO. : + 91-22-2761 6858

E-MAIL : [info@royalthermoset.com](mailto:info@royalthermoset.com)

WEBSITE : [www.royalthermoset.com](http://www.royalthermoset.com)

Thanks