

## Foreword

**A**lmost ¾ of the population on planet earth is estimated to live in cities by the year 2050. Mobility requirements are changing in rapidly expanding megacities. Asia has the most highly populated urban agglomerations in the world. How to keep these 12 to 37 million megacities inhabitants, such as in Tokyo, moving in the future while at the same time reducing carbon footprint.

Composite materials, proven in motorsport and low volume supercars, are now exciting the mainstream automotive industry. The materials and technology that an industry chooses is very linked to the volume of its production. Automotive is learning from Aerospace, even if their cycle time and processes are very different: hours for aerospace and minutes for automotive. © Audi



How far is composite for mass production in Automotive? Right now SMC/BMC and Thermoplastics are the ideal materials for mass production. The difficulty with carbon fibre is that it is an expensive and labour-intensive material to work with. There is also a lack of personnel expertise, inadequate composite processes for fast cycle time, a highly existing expensive production infrastructure...

Today, Automotive is the largest consumer of composite materials, accounting for over 20% of total consumption. The worldwide average for composites penetration is at around 6% of a car's weight. Carbon fibre is now firmly placed in each OEMs 'lightweight strategy'. The BMW Mega City Vehicle (MCV) is the world's first volume-produced vehicle with a passenger cell made from carbon.

Beyond 2015, a stronger increase in penetration should be expected (+2pts by 2020) as emissions regulation continues to increase, the cost of composites (carbon fibre in particular) begins to drop and innovation brings improvement in production efficiency. The chassis can account for up to 25% of a vehicle's weight and holds the most potential for weight reduction. By 2018/19 it should be cost competitive to produce the car chassis from CFRP for vehicle series of up to 40 000 units.

There are also new materials, design software, automation processes and End-Of-Life recycling solutions which come to the market as the automotive industry matures regarding composites materials.

The challenge is clearly coming from large consumption by the automotive industry in 2015. Automotive has clearly the potential to change.

Frédérique Mutel  
JEC President & CEO  
Présidente Directrice Générale

# Contents

<b>1- Introduction</b>	<b>2</b>	<b>APPENDIX I</b>	<b>29</b>
		Automotive industry structure and dynamics	29
<b>I – Executive Summary</b>	<b>5</b>	<b>APPENDIX II</b>	<b>45</b>
Asia is driving a new growth phase for the automotive industry	5	Automotive composites industry structure and dynamics	45
Sixty years of (slow) penetration growth in automotive composites	5		
2010-2015: the green shoots start to show	7	<b>APPENDIX III</b>	<b>59</b>
2015-2020: increasing penetration growth	7	Recycling	59
<b>II - Structure and dynamics of the automotive sector</b>	<b>9</b>	<b>APPENDIX IV</b>	<b>65</b>
1. Industry structure	9	Price of composites	65
2. Main dynamics	9	<b>APPENDIX V</b>	<b>69</b>
<b>- III -Structure and dynamics of the automotive composites sector</b>	<b>13</b>	Production efficiency with composites	69
1. Industry structure and characteristics	13		
2. Main dynamics and trends	15		
<b>- IV -Some Success Stories</b>	<b>23</b>		
1. BMW (MCV)	23		
2. Toray Industries	25		
3. Tesla	27		