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1. Summary of Findings and Recommendations
Automotive Composites Sector Overview

• The UK composites industry is currently dominated by SMEs.
  – Yet the automotive industry requires large players (at least at Tier 1 and Tier 2 level).

• There is a “chicken & egg” situation, with regards to future investment in manufacturing capability.
  – The OEMs will not consider large-scale introduction of composite materials into their vehicles until they are satisfied that manufacturing capability can meet their needs. However......
  – Tier 1s will not commit to significant investment in increased production capacity, without firm commitments from OEMs to use the materials.

• There is a window of opportunity for UK manufacturers to overcome this “chicken & egg” situation.
  – The OEMs are happy to source composite solutions overseas if necessary – they do this routinely for other materials and components. However.....
  – The OEMs cannot source composite solutions overseas at present, as they have not yet been developed – but they are being worked on.
  – If the UK is to avoid missing out, it needs to overcome this “chicken & egg” situation before overseas companies do.
Automotive Composites Sector Overview

• Many companies believe that current UK composites strategy and capabilities are aerospace focussed.
  – The requirements of automotive are quite different.

• There should be more support for product development and manufacturing and less towards research and development.
  – Recent cuts to the Regional Growth Fund and AMSCI are therefore disappointing.

• There should be less open-ended strategizing and more focussed implementation.
Implications for Tees Valley

• Apart from carbon fibre manufacture, the industry is not particularly energy-hungry.
  – Although there is a lack of clarity around energy requirements and energy costs.
  – There are also differing perceptions of the relative costs of energy in the UK versus the rest of Europe (and beyond).

• From a logistical point of view, the automotive industry would consider the Tees Valley region to be as good as any other within the UK.

• The availability of a skilled workforce would be an asset.

• The biggest attributes that could encourage inward investment are:
  – A stimulus package of some kind, and;
  – OEM support.
Potential for UK Government Support

• There is only a requirement for a UK supply chain if OEMs decide they need one.

• UKTI and the OEMs should therefore maintain a dialogue and clarify the roadmap for composites in the automotive sector.
  – This roadmap must lead to well-guided and monitored action.
  – It should also include tangible future volume predictions, to give confidence to the Tier 1s and 2s that there are genuine opportunities on the horizon.

• The initial focus of UK Government support should then be on supporting the Tier 1s and Tier 2s to deliver medium volume (50,000 – 100,000 units), automotive quality components – as this is the most obvious gap in the existing UK supply chain.

• If UK OEMs are looking to ensure security of supply, then the setting up of a UK carbon fibre plant would appear to make sense.
  – The important thing here would be the backing of one of the big OEMs (analogous to the BMW/SGL joint venture).

• UK Government should make information available which clarifies UK energy costs (and, ideally, provides comparison with other countries), to help support investment decisions.
2. Background & Scope
Background

• The Tees Valley is comprised of the local authority districts of Darlington, Hartlepool, Middlesbrough, Redcar & Cleveland and Stockton-On-Tees. As a conurbation, it contributes £11bn to the national economy every year. Its population is around 660,000 people with the catchment area population of the sub-region significantly higher, with up to one million people within thirty minutes drive time from its main centres and 2.7 million within one hour.

• The five main areas of Tees Valley exhibit key assets which have the potential to contribute to improving the economic performance of the area. For example, since the mid-1990s, progress has been made with increasing the employment rate, and new technologies and investment have underpinned business growth in digital media, renewable energy and process innovation, as well as securing Tees Valley’s world-class reputation for engineering, offshore and chemical excellence.
**Scope**

- Tees Valley Unlimited and UKTI commissioned NetComposites to carry out a study exploring the investment opportunities arising from composites manufacturing in the UK.

- Tees Valley Unlimited and UKTI wanted to gain an understanding of which parts of the UK automotive composites supply chain could be targeted for UK manufacture.

- Specifically, Tees Valley Unlimited and UKTI were seeking information from each part of the automotive composites supply chain, describing the current challenges and gaps being faced and work being done to reduce cost and to facilitate introduction of automotive composite parts into new and existing models.
3. Mapping the Supply Chain
Automotive Composites Supply Chain

- PAN Fibre Producers
- PAN Producers
- Carbon Fibre Producers
- Glass Fibre Producers
- Natural Fibre Producers
- Other Fibre Producers (e.g. aramid, basalt)

- Polymer Matrix Producers (thermosets and thermoplastics)
- Textile Producers (e.g. fabrics, stitched mats, preforms, non-wovens)
- Intermediate Material Producers (e.g. prepregs, SMC, compounds, cores)

- Consumables (e.g. films, papers, non-wovens)
- Tooling Suppliers
- Process Equipment Suppliers

- Tier 2 Suppliers (e.g. composite moulders, injectors)
- Tier 1 Suppliers (system integrators)
- Automotive OEMs

- Government (e.g. BIS, UKTI)
- Catapult (e.g. NCC, AMRC, WMG)
- Energy Suppliers

NetComposites Enterprise
Existing UK Capabilities

- PAN Fibre Producers
- PAN Producers
- Carbon Fibre Producers
- Glass Fibre Producers
- Natural Fibre Producers
- Other Fibre Producers (e.g. aramid, basalt)
- Polymer Matrix Producers (thermosets, and thermoplastics)
- Textile Producers (e.g. fabrics, stitched mats, preforms, non-wovens)
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- Tooling Suppliers
- Process Equipment Suppliers
- Tier 1 Suppliers (system integrators)
- Automotive OEMs
- Tier 2 Suppliers (e.g. composite moulders, injectors)

Supporting Entities
- Government (e.g. BIS, UKTI)
- Catapult (e.g. NCC, AMRC, WMG)
- Energy Suppliers

NetComposites Enterprise
Scope of this Study
4. The Interview Process
Interview Structure

• During the interviews, the aim was to discuss the following areas:
  – Interviewees current business
  – Interviewees future business
  – Skills
  – Government support
  – Tees Valley

• A series of questions was drawn up, to probe certain aspects within each of the above listed areas.

• However, where possible, we avoided rigid Q&A sessions in order to encourage more open responses.
Shortlisting Process

• A long list ~130 companies was drawn up, covering various elements of the UK supply chain*.

• From this list, a number of “high priority” organisations were selected for interview.

• A number of factors were considered when determining whether a particular organisation was “high priority”.
  – Company size.
  – Reputation within the automotive sector.
  – Technical relevance of the company’s product and/or service offering.

*Specifically, those elements highlighted in slide 14.
### Completed Interviews

<table>
<thead>
<tr>
<th>PAN Fibre Producers</th>
<th>Bluestar Fibres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Matrix Producers (Thermoset)</td>
<td>Scott Bader</td>
</tr>
<tr>
<td>Textile Producers</td>
<td>Formax</td>
</tr>
<tr>
<td></td>
<td>Sigmatex</td>
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<td></td>
<td>TFP</td>
</tr>
<tr>
<td>Intermediate Material Producers (Pre-pregs)</td>
<td>Hexcel Composites</td>
</tr>
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<td></td>
<td>SHD</td>
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<td></td>
<td>Gurit</td>
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<tr>
<td>Intermediate Material Producers (SMC)</td>
<td>Menzolit</td>
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</table>

<table>
<thead>
<tr>
<th>Intermediate Material Producers (Thermoplastic Pre-pregs)</th>
<th>TenCate Advanced Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tier 2 Suppliers</strong></td>
<td>EPM Technology Group</td>
</tr>
<tr>
<td></td>
<td>Lamplas</td>
</tr>
<tr>
<td><strong>Tier 1 Suppliers</strong></td>
<td>GKN</td>
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<tr>
<td></td>
<td>MTorres</td>
</tr>
<tr>
<td><strong>OEMs</strong></td>
<td>Nissan Technical Centre Europe</td>
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<tr>
<td></td>
<td>Jaguar Land Rover</td>
</tr>
<tr>
<td></td>
<td>Bentley Motors</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>IOM3 Automotive Division</td>
</tr>
<tr>
<td></td>
<td>SembCorp</td>
</tr>
</tbody>
</table>
5. Supply Chain Perspectives
# OEMs – SWOT

## Strengths
- OEMs have existing global distribution channels, with high levels of exports.
- There is a good UK supply chain for conventional material components.
- The UK has a strong reputation:
  - Presence of high end, prestige OEMs (many with existing experience of utilising composites in their vehicles).

## Weaknesses
- There is a lack of expertise in designing for and using composites.
- There is a lack of (published) concrete commitment to utilise composites in future vehicles
  - As a result, Tier 1s are reluctant to invest in production upgrades.
- Decision making centres for the large volume OEMs are often outside of the UK.

## Opportunities
- There is an opportunity to grow the supply chain relatively gradually – initially supplying the low and medium volume manufacturers (i.e. 5,000 to 100,000 units per annum).
- 2020 EU CO₂ emission limits present an opportunity to drive vehicle light weighting.
- There is also an opportunity for further light weighting of electric vehicles, to increase range.
- The potential shift of vehicle taxation away from consumers, onto manufacturers may encourage OEMs to push harder for the establishment of a UK supply chain (to minimise shipping costs).

## Threats
- Lower cost base overseas competitors.
- The introduction of composites is seen as too high a risk (e.g. for the reasons outlined below). As a result, the predicted volumes are not realised in the short-to-medium term.
  - High costs associated with new vehicle programmes.
  - Quality standards (e.g. zero-defect, A-class surface finish) seen as too demanding for current UK composite component production capabilities.
  - Perception of composites being difficult to maintain/repair throughout vehicle use.
- Major OEMs source globally so don’t view a UK composites supply chain as a necessity.
- OEMs may be risk averse, with regards to choice of suppliers
  - Leading them to stick with existing suppliers in Asia, Germany etc.).
- The potential shift of vehicle taxation away from consumers, onto manufacturers may lead OEMs to off-shore vehicle production (to avoid this taxation).
OEMs – Summary and Recommendations

• OEMs require significant drivers in order to switch from conventional materials to composites.

• These drivers could be technical or legislative.
  – An enabler for light weighting.
  – Forthcoming CO₂ emission targets.
  – Possible supply chain taxation.

• It is a question of when this will happen, rather than if it will happen.

• The UK supply chain (below the OEMs) needs to be in place to support this move, otherwise UK companies will miss out to competitors in mainland Europe (for example).
# Tier 1s – SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strong demand for auto products in general from UK auto industry.</td>
<td>• Tier 1s can bring back (re-shore) supply to the UK given the opportunity.</td>
</tr>
<tr>
<td>• Established relationships with suppliers of components.</td>
<td>• Expansion into associated transport industries.</td>
</tr>
<tr>
<td>• Good knowledge of the market, customers and products.</td>
<td>• Using the current government-sponsored drive (funding, technology assistance) to fund and develop more composites usage.</td>
</tr>
<tr>
<td>• Global approach to supply of components.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of credible, large composites component suppliers based in the UK.</td>
<td>• Large, high profile product recalls.</td>
</tr>
<tr>
<td>• Industry is led by OEMs so the Tier 1s have relatively limited scope to innovate independently.</td>
<td>• Risks of new technology, requiring significant investment.</td>
</tr>
<tr>
<td>• Many are foreign-owned and at the whim of global demand</td>
<td>• Foreign imports.</td>
</tr>
<tr>
<td>• Limited use of automated processes for the production of composite components.</td>
<td>• Upstream vertical integration by OEMs.</td>
</tr>
</tbody>
</table>
## Tier 2s – SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Significant knowledge-base in terms of composite materials and manufacturing processes.</td>
<td>• In terms of capability, there would appear to be space for an automotive-focussed, quality assured, medium volume (50k - 100k units/annum supplier) supplier employing an appropriate manufacturing technology (e.g. RTM).</td>
</tr>
<tr>
<td>• Ability to apply that knowledge to new solutions, i.e. innovative.</td>
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<tr>
<td>• Wide range of process capability.</td>
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<tr>
<td>• Capability is flexible and well dispersed nationally.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High proportion of SMEs.</td>
<td>• High product development / production investment cost for new programmes is viewed as a significant risk.</td>
</tr>
<tr>
<td>• OEMs/Tier 1s may doubt credibility as reliable, quality assured, suppliers.</td>
<td>• Lower cost base overseas competitors.</td>
</tr>
<tr>
<td>• A lack of medium-to-high volume moulders with a dedicated automotive base, i.e. product ranges tend to be diverse across a range of sectors.</td>
<td>• Meeting automotive quality standards (tight tolerances, zero defects, etc.) is challenging for composites.</td>
</tr>
<tr>
<td></td>
<td>• Few OEMs with a UK decision making base (in comparison, for example, to Germany, Japan).</td>
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<td>• Margins are low, a legacy of the recession.</td>
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</tbody>
</table>
Tier 1s and 2s – Summary and Recommendations

• The biggest gap in the UK supply chain is the lack of volume producers of automotive quality composite components.

• It is therefore where the biggest opportunity for UK Government support would appear to be.

• One approach would be to support existing large automotive Tier 1s and Tier 2s to invest in composites expertise and processing equipment.
  – Specifically, support towards capital equipment & product development is required.
  – Support for research and development is not.

• An alternative would be to support SMEs in investing in the necessary automation, quality programmes etc.

• If the UK does not act quickly to bridge this supply chain gap, there is a significant threat that overseas companies will develop the necessary high volume solutions and subsequently enter into supply agreements with the UK OEMs.
## Intermediate Materials – SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Skilled at producing bespoke materials.</td>
<td>• Higher volumes (mainly automotive).</td>
</tr>
<tr>
<td>• Lot of knowledge within companies.</td>
<td>• New markets (construction, rail).</td>
</tr>
<tr>
<td>• Robust QC due to aerospace demands.</td>
<td>• New composite materials &amp; processing routes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Large proportion of niche players.</td>
<td>• Lack of UK fibre supply.</td>
</tr>
<tr>
<td>• Small production volumes.</td>
<td>• Insufficient UK-based resin supply.</td>
</tr>
<tr>
<td>• High cost.</td>
<td>• Scaling up either of the above carries investment risk.</td>
</tr>
<tr>
<td></td>
<td>• Competitors in Germany &amp; elsewhere.</td>
</tr>
<tr>
<td></td>
<td>• Government support could be better focussed.</td>
</tr>
</tbody>
</table>
Intermediate Materials – Summary and Recommendations

• The business models of many of the intermediate materials producers are not necessarily well aligned with requirements of medium to high volume automotive.
  – The majority have positioned themselves as solution providers.
    • High levels of technical specialism.
    • Bespoke products.
    • Relatively low volume.
    • Relatively high value.

• These companies therefore need assistance in transitioning to higher volume (lower margin) production.

• This assumes, though, that they would interested in making such a change.
Matrix Producers – SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Resin formulation and resin production know-how.</td>
<td>• Increased use of composites across a number of sectors.</td>
</tr>
<tr>
<td>• Existing players already established in the UK.</td>
<td>• REACH.</td>
</tr>
<tr>
<td>• Chemical and process engineering expertise.</td>
<td></td>
</tr>
<tr>
<td>• Internationally recognised R&amp;D capabilities.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Limited production capacity.</td>
<td>• Lower cost, overseas manufacture.</td>
</tr>
<tr>
<td>• Reliance on overseas sources for raw materials.</td>
<td>• REACH.</td>
</tr>
<tr>
<td>• Slow exploitation of R&amp;D and IP.</td>
<td></td>
</tr>
</tbody>
</table>
Matrix Producers – Summary and Recommendations

• The traditional markets for composite matrix producers may be outside of automotive.

• Therefore they may need support transitioning into the automotive sector.
  – Increasing production to meet the volume requirements.
  – Developing the required quality standards.
  – Defining automotive product and processing requirements.
# Fibre Producers

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th><strong>Opportunities</strong></th>
</tr>
</thead>
</table>
| • Existing acrylonitrile, PAN and glass fibre production capability. | • Increased use of composites across a number of sectors.  
• Expected increase in demand for “automotive grade” carbon fibre (as opposed to aerospace grades).  
• Existing carbon fibre production capacity (globally) is insufficient to meet predicted demands. |

<table>
<thead>
<tr>
<th><strong>Weaknesses</strong></th>
<th><strong>Threats</strong></th>
</tr>
</thead>
</table>
| • Limited production capacity.  
• Relatively energy costs. | • Other countries offering financial incentives to relocate PAN and carbon fibre production plants.  
• Lower cost, overseas manufacture. |
Fibre Producers – Summary and Recommendations

• The UK would appear to have all of the elements necessary to set up a new carbon fibre manufacturing plant:
  – PAN production capability.
  – Regions with affordable energy.
  – Good skills base.

• However OEM support is required to justify production and provide confidence to rest of the supply chain.

• Without this OEM drive, there would be significant risk in setting up such a plant.

• The focus should therefore be on encouraging the OEMs to talk to the fibre manufacturers and commit to a longer term strategy for carbon fibre composites.
To discuss further contact:

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