INDUSTRIEVEREINIGUNG
VERSTÄRKTE KUNSTSTOFFE
FEDERATION OF REINFORCED PLASTICS

The Market for Glass Fibre Reinforced Plastics (GRP) in 2020

Market developments, trends, outlooks and challenges

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November 2020

Contents

The European Market for Glass Fibre Reinforced Plastics (GRP) in 2020

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The AVK, as the German professional association for fibre composite plastics/composites, represents the interests of producers and processors of reinforced plastics/composites on a national and a European level.

Its services include organisation of task forces, seminars and conferences as well as providing market relevant information (www.avk-tv.de).

The AVK is one of the four national pillars of the GKV – Gesamtverband Kunststoffverarbeitende Industrie and an international member of the European composites confederation EuCIA – the European Composites Industry Association.

The AVK is a foundation member of Composites Germany.

1 Summary and introduction

A market overshadowed by the Corona pandemic

After six years of continuous growth, the European production volume of GRP stagnated for the first time last year. In 2020, the European GRP market is now experiencing the sharpest slump since the economic and financial crisis of 2008/2009. Production volume has fallen by 12.7% to 996,000 tonnes.

This massive decline is mainly due to the coronavirus/SARS-CoV-2 pandemic, which has been ongoing since February of this year, not least in Europe. Initially, the transport sector was among the hardest hit areas of the economy, with the automotive and aviation segments suffering most acutely. In the meantime, however, almost all application areas have been affected by losses, although to varying degrees.

In regional terms, southern European countries and the UK/Ireland have suffered the greatest declines. Germany and the Eastern European countries reviewed in this report have been less severely affected, although their volumes are also declining.

Glass fibre reinforced systems (GRP) remain by far the dominant materials in terms of quantity, regardless of the development of other market segments. GRP accounts for well over 90% of fibre reinforced plastics/composites production.

As mentioned above, all sectors of the economy are affected by the Covid-19 pandemic. After assuming a dramatic fall in GDP of 7.4 % for the EU as a whole and 7.7 % for the euro zone in its spring forecast, the European Commission revised these figures downwards still further in its summer forecast. According to the latest survey carried out in July, the euro zone economy is forecast to contract by 8.7 % this year and the EU as a whole by 8.3 %. Significant growth is forecast for the coming year.

As was the case during the economic and financial crisis, the declines in the GRP sector will be worse than those in the overall economy. The two main customers for GRP products are the transport and construction sectors. The transport sector, in particular, was and remains particularly badly affected by the economic contraction.

The corona pandemic and the measures associated with it, including the initial lockdown, must be seen as the principal causes of the current, rather exceptional development. However, it would be wrong to see them as the sole and exclusive reasons for the weak market environment. Last year, the markets were already being affected by growing political uncertainties both within the EU and in international trade. Even in the second half of 2019, macroeconomic events and processes, e.g. Brexit, trade conflicts, the protectionist policies of various countries and a slowdown in world trade, were leading to greater uncertainty and generally declining expectations regarding the future development of the composites market. Thus, the trend towards cost-cutting and corporate restructuring, increasing stock market uncertainty, declining investment activity and an unsettled overall economic climate were already evident last year. Lack of visibility and continuing weakness in core markets, such as cars and commercial vehicles, were also resulting in pessimistic forecasts well before the outbreak of the pandemic – which has hit the markets with a force that could not have been anticipated. Nevertheless, the structural changes that were taking place before the pandemic should not be overlooked when implementing countermeasures and preparing for the future.

2 Markets reviewed in this report

To ensure the data in this report remain comparable with those of previous years, the GRP materials considered here again include all glass fibre reinforced plastics with a thermoset matrix and, in the thermoplastics market, glass mat reinforced thermoplastics (GMT), long fibre reinforced thermoplastics (LFT) and all the quantities of continuous fibre reinforced thermoplastics this encompasses.

Data on European production of short glass fibre reinforced thermoplastics are only available as for overall quantities and are therefore stated separately. Natural fibre reinforced plastics (NRP) is presented here only in an aggregated form.

The GRP Market Report considers all relevant European countries for which production figures can be recorded and validated.

3 General trend

In the current year, European GRP production volume is expected to fall by 12.7 %. As a result, the total volume of the European GRP market is 996,000 tonnes (see Fig. 1). The market is thus experiencing its sharpest decline since the crisis of 2008/2009.

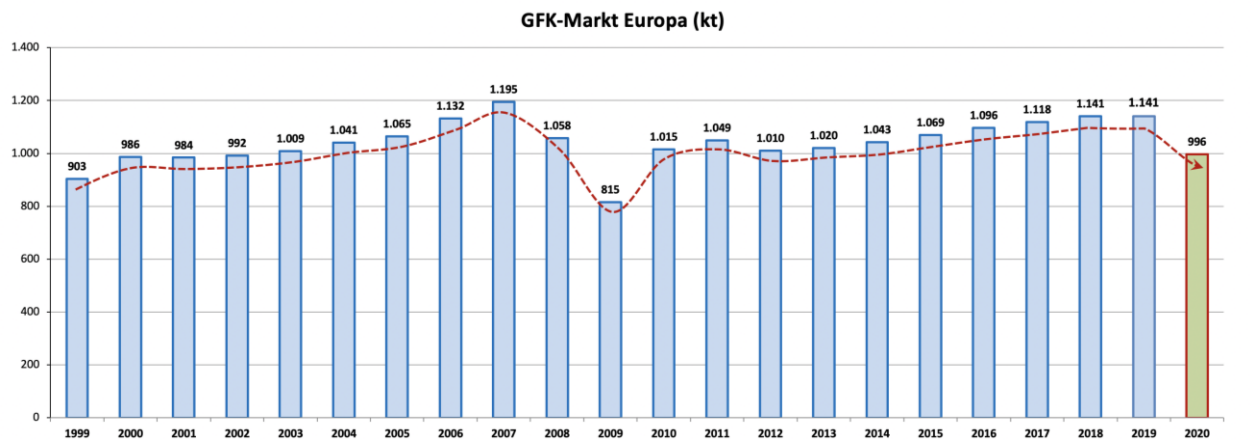

Fig. 1: GRP production volume in Europe since 1999 (in 000 tonnes) (2020* = estimate)

However, as in previous years, the trends within the EU are not uniform.

There are regional differences, especially between the individual processes, although no growth will be recorded for any region or process this year. These differences can be attributed to the high variability of the processed materials, wide range of manufacturing processes and significant divergences between application areas.

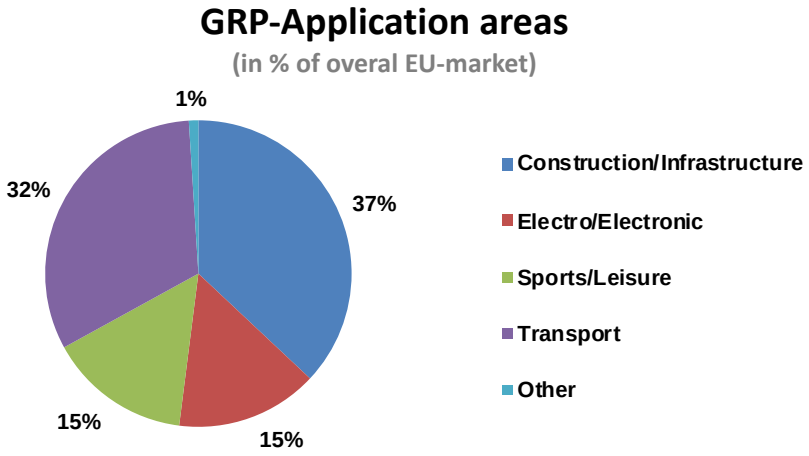

Fig. 2: GRP market by application areas in 2020 (as % of the total European market)

In 2019, a fundamental shift in the application areas was already noticeable. For the first time, the construction/infrastructure sector was larger than the transport sector. This trend is ongoing and, once again, impressively demonstrates that fluctuations within these two very large industries also lead to fluctuations in the GRP sector.

The major sales crisis in some areas of the automotive sector, which responds more quickly to changes in demand than the construction industry, is directly reflected in market forecasts and trends in the GRP industry.

Generally, it can be said that the high macroeconomic importance of these two principal fields of application for GRP is one reason why GRP production volume tends to follow the trend lines for gross domestic product and total industrial production (see Fig. 3). Despite the public and media focus on large individual projects over recent years, e.g. the activities of BMW or Airbus, the composites market is still characterised by a large number of mainly small and micro-enterprises. A few years ago, EuCIA estimated that there were approx. 10,000 companies in the European composites sector, employing a total of approx. 125,000 staff. However, in many European countries, 80-90% of the production volume is accounted for by just 10-20% of the companies, despite this large number of producers.

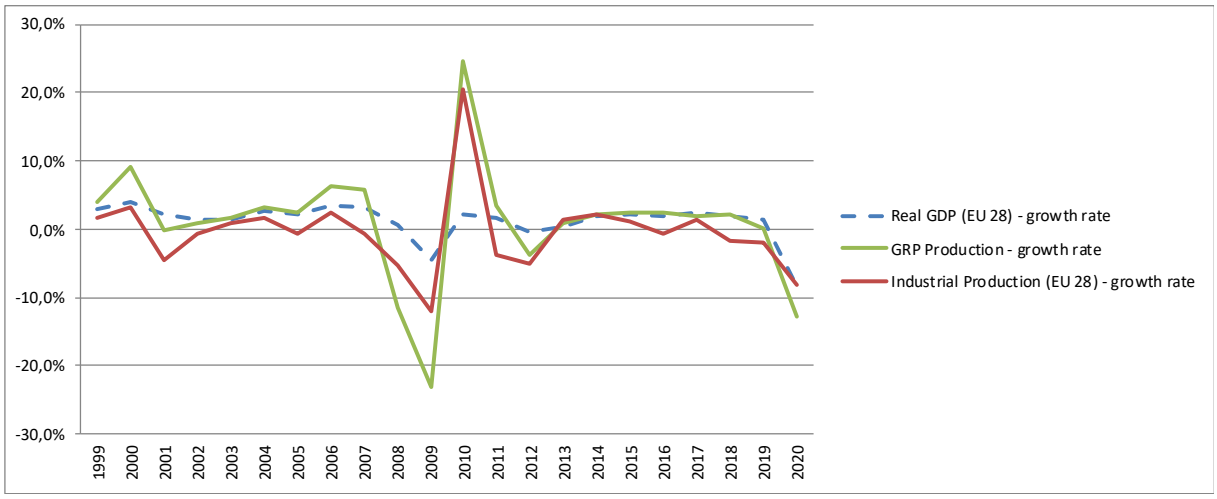

Fig. 3: Correlation between GRP production and the overall economy (Sources: EUROSTAT, Trading Economics and in-house survey; 2020 = forecast)

4 GRP production in Europe

In 2020, the European GRP market will shrink by 12.7 % to a total volume of 996,000 tonnes The moderate growth of recent years will not continue. The declines will affect all regions and almost all application areas. A detailed analysis of the countries/regions and application/production areas is provided from Section 5 onwards.

Even in recent years, growth in GRP production volume has been slower in Europe than in the world's other two major economic powerhouses – America and Asia. Despite growing in absolute terms, European production volume has lagged behind American (mainly USA/North America) and Asian (especially China) growth rates in percentage terms.

For 2019, a worldwide production volume of 10-12 million tonnes can be assumed for the composites industry, depending on the data source. Current data for 2020, that take account of the Covid-19 pandemic, are not yet available to the AVK. However, assuming there is a close connection between GRP production and worldwide economic growth, the OECD's GDP forecast provides an important point of reference (see Fig. 4). In its analysis, the OECD distinguishes between the so-called single-hit scenario (a second corona wave is avoided) and the double-hit scenario (a second wave of infection occurs before the end of 2020). Under both scenarios, the EU will be significantly more affected by declines than the world as a whole. A decline of 9.1 % or 11.5 % is assumed for the euro zone. According to this assessment, southern European countries will be hit even harder by the recession. Somewhat less dramatic falls are expected in the USA (-7.3 % and -8.5 %) and China, too, seems to be coming through the crisis much better (-2.6% and -3.8%).

Despite all the differences in the respective countries, these estimates support the assumption that Europe will continue to lose its share of the global composites market over the course of the year and that the global market as a whole will also decline by a single-digit percentage.

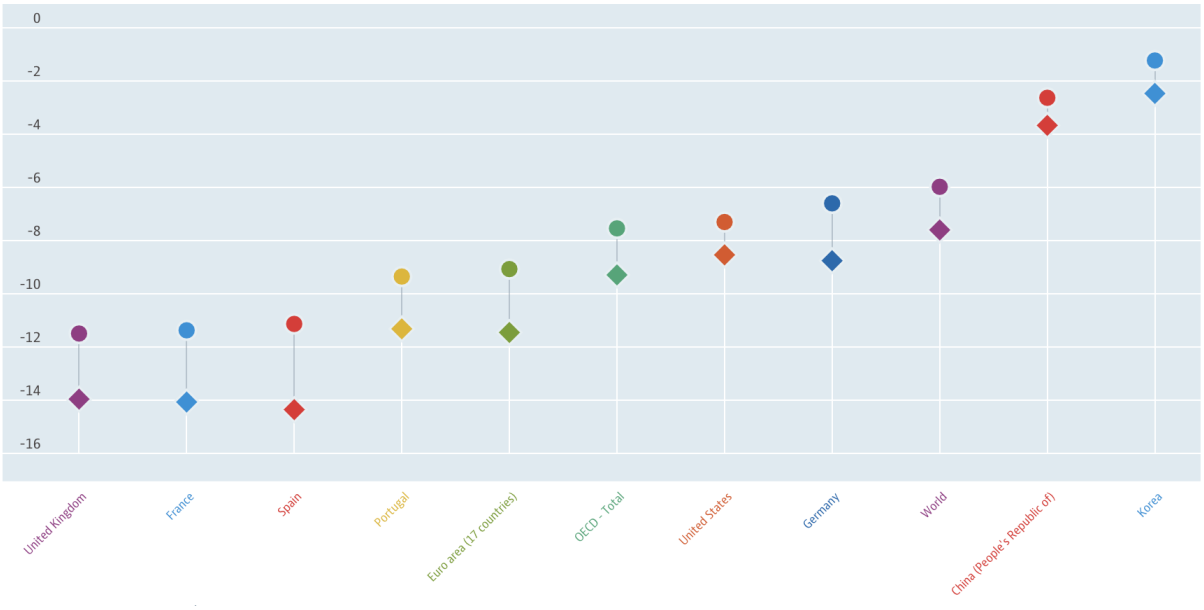

Fig. 4: Real GDP forecast: Double-hit scenario / Single-hit scenario, Annual growth rate (%), 2020 (Source: OECD library)

The reasons for this slower growth, which has been ongoing for several years and is independent of the current pandemic, include the migration of certain manufacturing processes and methods, but also the outsourcing of the production of commodities with often low profit margins. Some specific application and customer industries are growing more dynamically in other regions of the world than in Europe. Other sectors within these industries are experiencing slowdowns. Despite some major corporate mergers in the sector, the European GRP industry continues to be characterised by a very high level of international interdependence and a large number of small and micro-enterprises. Large companies are often to be found only in the supplier or raw materials industries. Overall, it remains to be seen how the current trends towards cost reductions and corporate restructuring will affect the composites industry.

5 Trends in the development of processes/components

Table 1 shows the trends in the production volume of essential processes/parts for GRP production over recent years. The names of the individual segments are not always entirely strict or selective, but this report will continue to use them to enable readers to compare the values as effectively as possible. However, in addition to these processes, there are many other production processes/technologies which can essentially be classified under one of the areas mentioned.

	2016	2017	2018	2019	2020
SMC (kt)	198	202	204	205	174
BMC (kt)	76	78	81	82	70
SMC/BMC (kt)	**274**	**280**	**285**	**287**	**244**
Hand lay-up (kt)	140	140	140	139	121
Spray-up (kt)	97	98	99	98	88
Open mould (kt)	**237**	**238**	**239**	**237**	**209**
RTM (kt)	**141**	**146**	**148**	**148**	**131**
Sheets (kt)	89	93	96	94	85
Pultrusion (kt)	50	53	55	56	50
Continuous processing (kt)	**139**	**146**	**151**	**150**	**135**
Filament winding (kt)	80	78	79	78	70
Centrifugal casting (kt)	68	67	69	68	60
Pipes and Tanks (kt)	**148**	**145**	**148**	**146**	**130**
GMT/LFT (kt)	**140**	**145**	**152**	**156**	**132**
Others (kt)	**17**	**18**	**18**	**17**	**15**
Total Market (kt)	**1,096**	**1,118**	**1,141**	**1,141**	**996**

Table 1: GRP production volumes in Europe according to processes/components – current year and the four previous years (kt = 000 tonnes, 2020 = estimate)

SMC/BMC continues to be the largest segment in terms of volume. This is followed by the so-called “open processes” which often have a strong emphasis on manual skills and craftsmanship. In terms of quantities, the other processes mentioned here are at a similar level. However, these absolute figures somewhat obscure the long-term trend seen in Fig. 5.

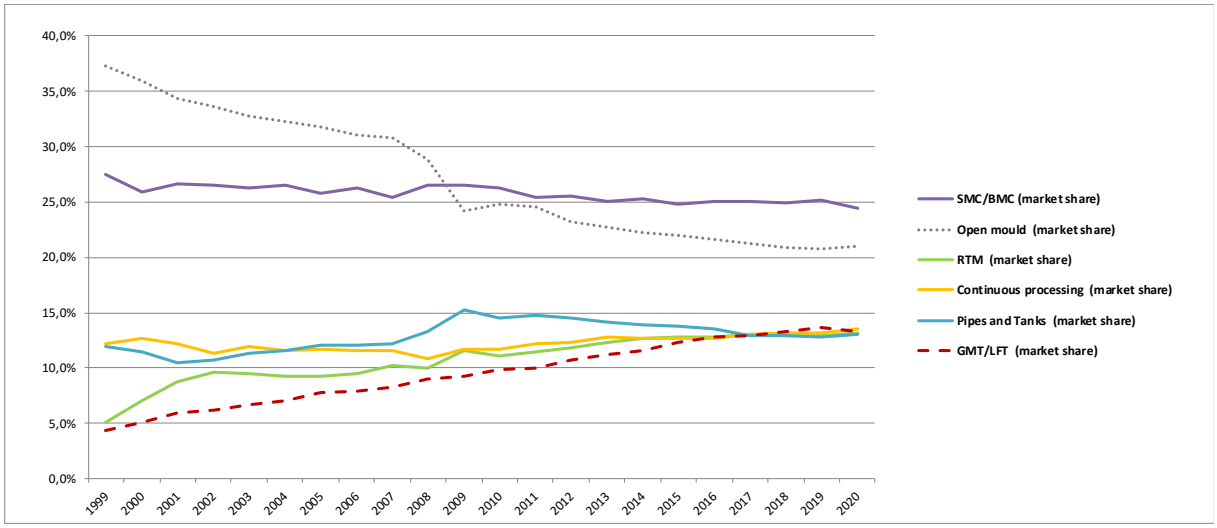

Fig. 5: Long-term trends for GRP market segments (share of total market, 2020 = estimated)

It shows that the trend has steadied despite the exceptional current market environment. Open processes, above all, have lost much of their market share over the last 20 years. The market share of SMC/BMC – now the largest segment in the GRP processing sector – has remained virtually constant. Above-average growth in the area of thermoplastic processes is also evident. Even though the current sales crisis is very marked in this area, it is expected that this segment will offer the greatest growth opportunities in the medium term. However, it should be remembered that thermoset systems account for by far the largest market share in the area of long and continuous fibre-reinforced materials – and innovations and developments are constantly being generated in this area, too.

The following section contains individual analyses of the various segments considered in this report:

5.1 SMC/BMC

SMC (sheet moulding compound) and BMC (bulk moulding compound) components account for around one quarter of total production and are the largest market segment of the GRP industry. The semi-finished products/moulding materials are processed using compression moulding or injection moulding.

SMC/BMC are primarily used in (large scale) series production applications. Both materials have been well-established in the electro/electronics and transport sectors for many years. Typical applications include headlight systems, lamp housings, control

cabinets and cases as well as exterior components for use in commercial vehicles, automobiles and vehicles for local public transport networks.

This year the SMC/BMC sector will shrink by 15 %, to a volume of 244,000 tonnes. Alongside thermoplastic systems, this market segment is thus the most severely and disproportionately affected by the current crisis. One reason for this is its close relationship with the automotive industry. Although the sector is showing signs of improvement, this cannot compensate for the heavy losses at the beginning of the year.

SMC is the much larger of the two market segments, with a volume of 174,000 tonnes. With a 14.6 % drop in production, the BMC market has been slightly less affected by the crisis than the SMC market segment. Total BMC production volume is 70,000 tonnes.

Despite the sharp contraction due to special factors this year, SMC/BMC processing remains an extremely promising process for the industry. The strong interest in semi-finished products and these processing technologies observed last year continues. The regular Composites Index survey conducted by the trade association Composites Germany (www.composites-germany.org) shows that expectations for the SMC/BMC segment are improving for the second half of the year. The survey asks composites companies for their qualitative assessments of the market trends. In addition to thermoplastic processing methods, SMC/BMC technology is currently the process that is expected to provide significant impetus to the market (see Fig. 6).

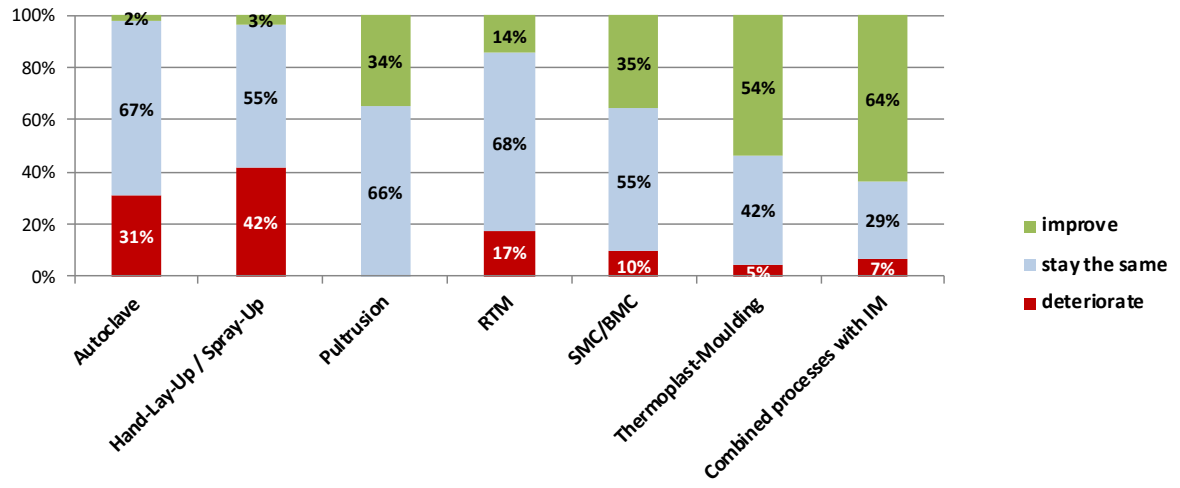

Fig. 6: Composites Germany Market Survey H2 2020 – Assessment of trends for selected processing methods

The SMC/BMC industry continues to work on a wide range of innovative products and product enhancements. The most important of these are high-performance SMC (carbon fibre reinforced SMC), continuous fibre reinforced SMC and natural fibre reinforced SMC.

On the one hand, these materials aim to boost the sustainability of the corresponding components. On the other, they seek to open up new application areas for this technology – especially in the field of highly stressed or structural components. The results of the first beacon projects have now been presented in several segments and it is time for these materials/material systems to prove their worth in series production processes. It remains to be seen whether the corresponding applications will be widely adopted in the long term.

5.2 Open processes

With a total production volume of 209,000 tonnes, “open processes” – hand lay-up and spray-up – continue to be the second largest segment in the European GRP market after SMC/BMC. As Fig. 7 shows, however, its share of the total market has fallen from over 37 % (in 1999) to just 21 % this year.

Open processes have thus been the fastest declining segment in Europe over the past 20 years. For 2020, a minus of 11.8 % can be considered slightly less negative than the trend for the market as a whole.

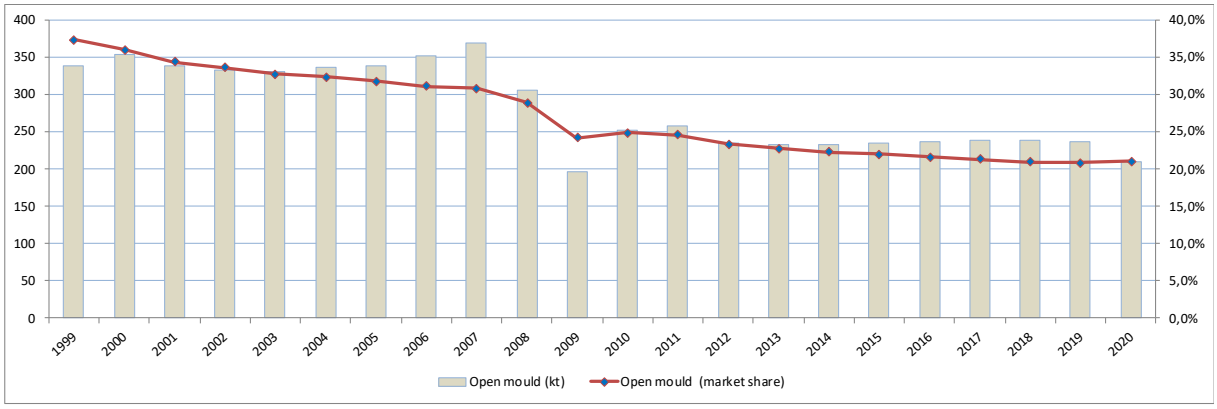

Fig. 7: Market trend for “open processes” in Europe (in 000 tonnes and % market share)

This trend applies equally to spray-up (-10.2 %) and hand lay-up (-12.9 %). Although the declines this year are relatively moderate compared to other segments, the market share of these production processes is expected to continue its decline in the long term.

One explanation for the less severe declines in production levels could be an increase in swimming pool construction. Due to the lockdown and associated travel restrictions, pool construction has seen very robust growth. The willingness of private households to invest in these home improvements has been very high in the current year.

In general, despite the further decline expected over the coming years, open processes will continue to make a key contribution to GRP production volumes. Indeed, they are often the method of choice – especially in the field of bespoke and custom-made products or small batch sizes – due to their low investment costs. Spray-up and hand lay-up – the original techniques for processing GRP – continue to perform very well in the production of large, highly complex components or products.

The enduring and increasingly strict statutory processing regulations, especially for unsaturated polyesters/styrenes, and changes to the limit values for other raw materials are making production in Europe ever more costly and difficult.

As well as these stricter regulatory requirements, which sometimes mandate costly renovations/modifications to production facilities, the industry is also reporting that it is becoming more difficult to find suitable and well-trained employees – another challenge for manufacturers.

The trend towards the replacement of open processes with closed production methods – especially by RTM technology – is well established and seems set to continue.

5.3 RTM

In this report, the RTM (resin transfer moulding) segment comprises all processes in which resin is infused/injected into a closed cavity. These include a variety of injection methods (HP-RTM, P-RTM, RTM-Light, etc.) as well as infusion processes.

An enormous range of RTM processes have been developed over recent years. All use dry fibre/fibre semi-finished products. Once the mould has been lined with reinforcing materials (fibre products or, e.g. core materials), it is closed/sealed and the resin introduced into the cavity of the closed form either under pressure and/or vacuum.

The resin flows around or through the fibres and any additional products/semi-finished products.

After a phase of continuous outperformance and increasing market shares, the RTM segment has now been stagnating for four years with a market share of around 13 %. The trend's momentum is thus weakening to some extent. This year, the market segment declined by 11.5 % to a production volume of 131,000 tonnes.

The technology is used in a very broad spectrum of production processes and encompasses a wide range of process variants. Volumes can range from just a few units to larger series. It can be used to manufacture both small components and larger products. In addition, it is suitable for use with many different fibre and matrix systems. Typically, it also uses corresponding preforms.

As a result, it is used in a wide range of applications – from vehicle construction to wind turbines, boat and ship building, sports and leisure, and aerospace.

The specifics of the RTM process make it ideal for manufacturing highly stressed components. At the beginning of the 2010s, RTM technology was considered by many to be the process of choice for large-scale automotive production. Today, however, research is focusing on other processes. Thermoplastic processes, in particular, seem to have been more widely adopted in large-scale production, which explains the drop in momentum.

5.4 Continuous processes

The production of GRP components using continuous processes (pultrusion and flat panel production) has fallen by 10 % in 2020. Despite this huge decline, continuous processes are the least affected by the crisis. The overall production level for pultrusion is down by 10.7 % and for flat panels by 9.6 %. Total production volume for 2020 is expected to be approx. 135,000 tonnes.

At 85,000 tonnes, flat panel production is a much larger market segment than pultrusion, which has a production volume of 50,000 tonnes.

Panels have been used in vehicles for many years, primarily in truck side panels, caravan superstructures or the conversion of commercial vehicles. These applications are supplemented by products used in facades. Like pool construction, the caravan industry is also profiting from the unusual current market environment to a certain

extent. It appears that exports to the USA are the principal reason that this segment is faring better than others.

Pultrusion is used to produce continuous profiles. Like SMC/BMC technologies and thermoplastic processes, pultrusion is often considered to have a very promising future due to the process specifications. This is confirmed by the aforementioned survey conducted by Composites Germany and the Composites Index.

Within the pultrusion industry, the construction and infrastructure sectors are considered possibly to be major markets of the future. Products for these areas include, for example, reinforcement systems for bridges and buildings, window-, stair- and ladder profiles, as well as antenna systems (keyword: 5G networks). In the above sectors, other specific properties of the materials play a key role alongside their light weight. For example, they must be transparent to radio waves, corrosion resistant, require little or no maintenance, permit load-specific designs and be electrical and thermal insulators.

In many cases, however, the necessary general industrial approvals and norms/standards which would further promote their use have still not been agreed. This lack of “security” increases the reluctance of many architects and decision makers to adopt these materials. Moreover, many decision makers still know too little about the advantageous properties that GRP offers compared to other building materials.

5.5 Pipes and tanks

The market segment of GRP pipes and tanks manufactured using centrifugal casting or filament winding processes has also declined significantly by 11 % this year. Total production volume for this segment will be 130,000 tonnes in 2020 – comprising 70,000 tonnes for the filament winding processes and 60,000 tonnes for the centrifugal casting processes. At -10.3 %, the filament winding processes are suffering a slightly less negative growth than the centrifugal winding processes with -11.8 %.

GRP pipes and tanks are principally used in plant construction and public/private pipelines as well as by customers in the oil/gas and chemicals industries.

This segment is currently dominated by relatively few, large producers, whose operations have a comparatively high level of material throughput – at least for the GRP industry.

GRP pipe/tank and plant construction is a typical area in which GRP materials offer many advantages, such as excellent resistance to aggressive media such as salt etc.

The use of GRP can often significantly reduce maintenance and extend service life. Moreover, it can be used in load-specific designs that offer enormous advantages in many application areas.

In addition to requirements resulting from standards, the main obstacle to the adoption of GRP products is operators' and planners' ignorance about these materials and their properties.

There is still strong growth potential in the pipe sector, and especially in tank and plant construction, that could be tapped by further improving general awareness of GRP. A great deal of research is also underway, especially in the field of filament winding technology. For example, hydrogen tanks are currently being wound (with the aid of carbon fibres), which can withstand a pressure of several 100 bar while also being extremely light. Very interesting possibilities are emerging here, e.g. in future applications for the automotive sector, which do not yet account for a significant market share.

5.6 GMT/LFT

Glass mat reinforced thermoplastics (GMT), long fibre reinforced thermoplastics (LFT) and continuous fibre reinforced thermoplastics are the only thermoplastic materials reviewed in this GRP market report. Their material properties, applications and, in some cases, processing methods are affected by many of the same issues as long and continuous fibre reinforced thermosetting materials, so it is still reasonable to consider both these areas together. Materials with short glass fibre reinforcement (< 2 mm fibre length) differ significantly from the materials considered in this report in terms of the influence on material properties and (load-specific) alignment. Consequently, they are not included in this survey of the GRP market.

The markets for GMT and LFT are experiencing a greater than average decline of 15.4 % this year. The market segment volume has fallen to 132,000 tonnes. For the first time in many years, its share of the total market has declined to 13.3 % (see Fig. 8).

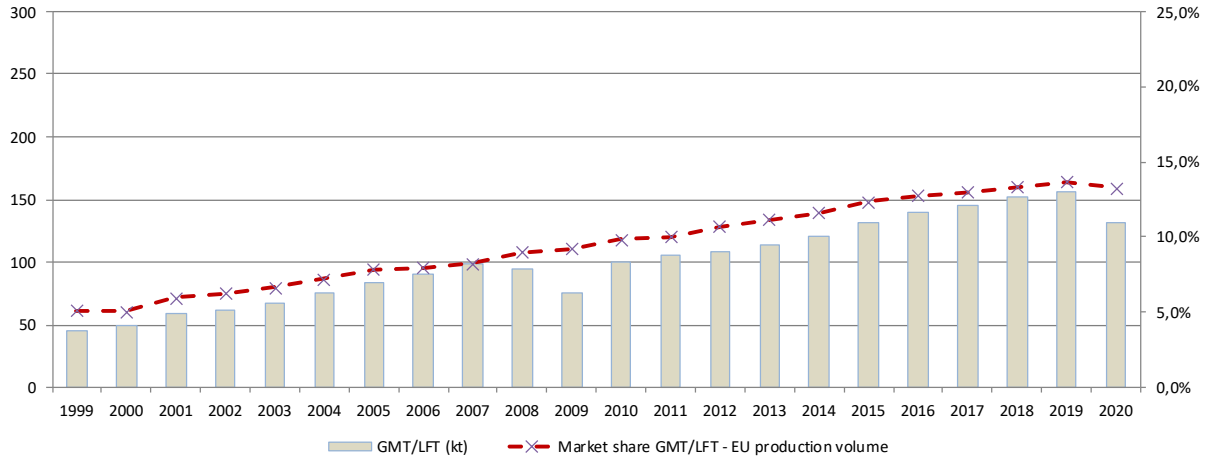

Fig. 8: Growth in GMT/LFT production (000 t) and market share of total European GRP production volume

The sharp decline in production volume highlighted by the chart can be explained by the segment's very strong links with the automotive industry. As in the SMC/BMC sector, the current positive trends in the automotive sector are not sufficient to compensate for the serious contraction, especially in the first half of the year.

LFTs are the largest category of thermoplastic materials. Fig. 9 shows the estimated shares of the respective production processes. As can be clearly seen, the market share of LFT systems compared to GMT has increased significantly in recent years.

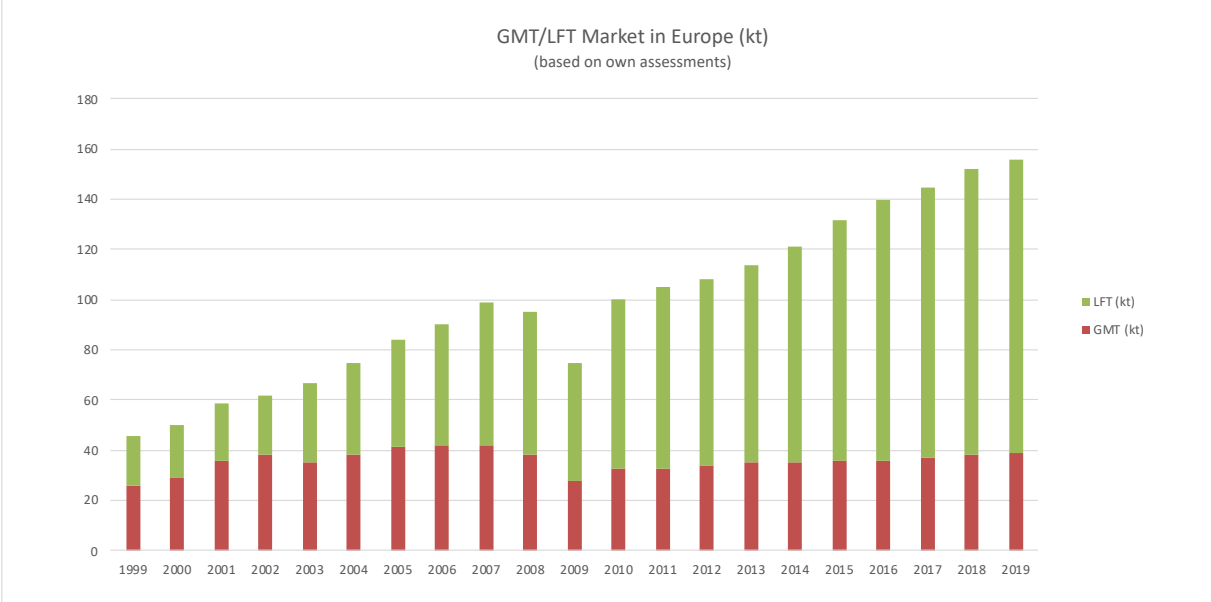

Fig. 9: Respective market shares in the GMT/LFT market (in 000 t)

For several years, however, continuous fibre-reinforced systems have become the focus of attention. These are mainly pre-consolidated semi-finished products, such as tapes or flat semi-finished products (“organosheets”). In this area, the focus is primarily on the hybridisation of processing methods, e.g. combining them with injection moulding and forming. The first major projects have already established themselves in the market. For example, a door module in the current Ford Focus is being produced in large-scale automotive series using organosheets as a partial reinforcement. Production quantities of around 2 million units per year are being achieved.

Projects in the automotive industry, as well as applications in the electronics and sports sector, are generally the growth drivers for thermoplastic materials. Typical current applications for these products include underbody protection, bumpers, instrument panels or seat structures.

This segment offers enormous growth potential for the future. New developments and enhancements in the field of organosheets and LFT, as well as the aforementioned hybrid solutions made from continuous fibre reinforced semi-finished products with rear injection using unreinforced material, are paving the way for a host of exciting applications. In addition to the generally outstanding properties of the materials, the key drivers here are the ability to produce large quantities with very short cycle times, the recyclability of the materials and the excellent opportunities for integrating later products into existing systems.

6 GRP production in 2020 by country

As mentioned in the introduction, the market trends within the European countries reviewed in this report vary enormously. While the overall market fell by 12.7 % year-on-year to 996,000 tonnes, growth rates in the countries considered ranged from -8 % to -17.4 %. Table 2 shows the trends for each country/region in detail.

	2016 (000 t)	2017 (000 t)	2018 (000 t)	2019 (000 t)	2020 (000 t)
UK / Ireland	152	153	155	155	128
Belgium / Netherlands / Luxembourg	45	46	46	45	40
Finland / Norway / Sweden / Denmark	40	40	40	39	34
Spain / Portugal	158	161	167	166	141
Italy	154	158	162	161	135
France	110	112	115	114	96
Germany	220	226	229	225	207
Austria / Switzerland	18	19	19	19	17
Eastern Europe*	199	203	208	217	198
Sum	1096	1118	1141	1141	996

Table 2: GRP production volumes in Europe itemised by country/group of countries (kt = kilotonnes / 2020 = estimated / Eastern Europe* = Poland, Czech Republic, Hungary, Romania, Serbia, Croatia, Macedonia, Latvia, Lithuania, Slovakia and Slovenia)

None of the countries considered here recorded growth in 2020. The trend appears particularly dramatic in the UK/Ireland, where the market slumped by 17.4 %, and in Spain/Portugal where production declined by 16.1 %. As was the case during the economic and financial crisis, German industry currently appears far more able to cope with the difficult situation. With a decline of “only” 8.0 %, the situation in Germany is much more positive than the average. Eastern European countries are also standing their ground with similar “success” – declining by just 8.8%. Once again, the crisis appears to be hitting Southern European countries much harder than Central and Eastern European regions.

The diverging trend lines are also leading to a significant shift in market shares in the European market as a whole. Germany and Eastern European countries are growing significantly, while all other major regions are generally losing market share.

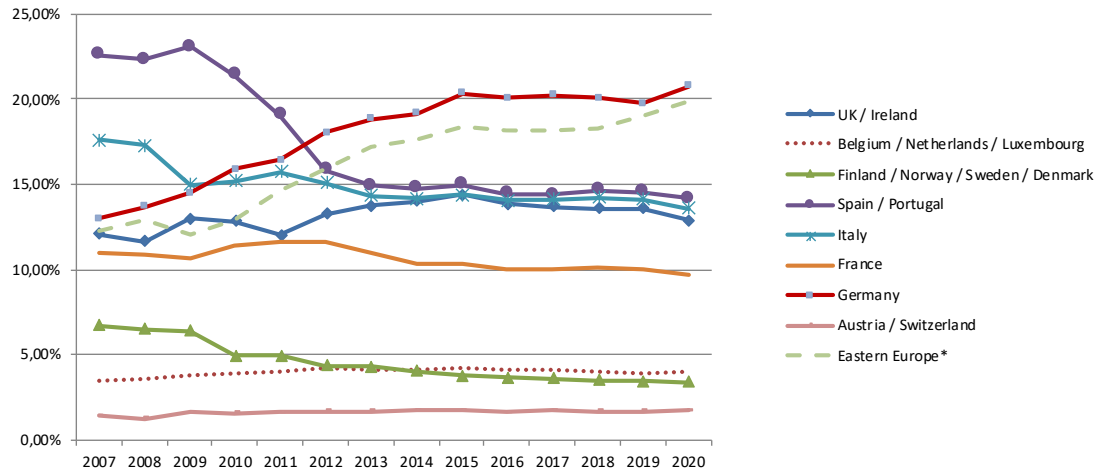

Fig. 10: Market share of individual countries/regions in the European GRP market

The figures presented illustrate the different orientations within the respective countries and regions. For this reason, a pan-European view can only ever provide a rough indication of developments or point to fundamental trends. The details of these developments often vary considerably depending on the specific core markets and primary applications within the countries. For example, façade elements and front doors are important applications in some southern European countries, whereas in Germany they hardly play any role at all. In Turkey, pipe and tank systems have dominated the market in terms of volume for many years, with a share of almost 50 %. In contrast, they play a fairly minor role in Germany, where automotive applications and the electro/electronics industry are more dominant. In Norway and Sweden, however, the most important applications are found in the oil and gas industry.

This report has been presenting market data for the Turkish composites market for many years. Due to the lack of information for long-term comparisons, these data are still presented separately. In 2020, the Turkish trade association is reporting a fall in production of 10 % compared to the previous year to a total volume of 225,000 tonnes. Approx. half of production volume is used in the construction sector and for manufacturing pipes and tanks. The automotive and transport sectors account for 30 %. Wind energy is the third largest application area with 12 %.

7 Other composite materials

7.1 Short glass fibre reinforced thermoplastics

As already mentioned, there are some clear differences between the properties of short glass fibre reinforced materials and long or continuous fibre reinforced systems. However, these important materials are still composites – not least because they are plastics reinforced with fibres. The glass fibres they contain generally have a length of < 2 mm. Nevertheless, they make the materials much stronger than their non-reinforced equivalents. Above all, they have a positive influence on the elastic modulus and rigidity of the materials. As the fibre length increases, the rigidity and impact strength of the composite increase as well.

The European market for thermoplastic, short glass fibre reinforced materials is declining for the second consecutive year. While production in 2018 still totalled 1.544 million tonnes, this fell by approx. 10 % to 1.39 million tonnes in 2019. This year, the decline of 15 % is even more pronounced than in the rest of the GRP market considered in this report. A production volume of 1.19 million tonnes is expected in 2020. *(Source: AMAC)*

Despite these two difficult years, it should not be forgotten that the market for short glass fibre reinforced thermoplastics was still significantly larger than the GRP market considered here in the same period.

The dominant material in this market is polyamide (PA), which accounts for more than 60 % of the matrix materials used in the sector. The second largest group is polypropylene (PP). Together, these two matrix material systems account for over 85 % of the market. The picture is different in the area of LFT described above. Here, over 90% of the material used is PP.

Applications are primarily found in the automotive sector, but also in the electro/electronics sector and consumer goods. This market segment's particularly close ties with the automotive industry explain the strong declines. Covid-19 is also the key reason for the currently precarious situation. Nevertheless, the structural changes within the automotive sector should not be overlooked. The adoption of new drive technologies (keyword: e-mobility) was leading to some substitution of materials even before the corona pandemic. The details of these shifting environments, and whether

and to what extent individual materials are being substituted, must be considered on a case-by-case basis. The reasons underlying decisions to switch materials are often very complex and cannot be generalised.

7.2 Natural fibre reinforced plastics

In addition to GRP and CRP – the two key groups already mentioned – natural fibre reinforced plastics (NRP) form the third most important group of materials in terms of production volume.

According to an AVK survey within this special composites segment, thermoplastics are the most important materials used in this market, although thermosetting materials are also used. Unfortunately, no current figures regarding the precise volumes being processed are available. However, it can be assumed that the market for these materials in Europe is at least 90,000 tonnes. The last survey of production volumes, for 2012, recorded a volume of 92,000 tonnes of NRP (S*ource: nova-Institut GmbH*).

The largest application area for these materials is the automotive sector, followed by the consumer goods industry. The fibres used are mainly flax, hemp, jute and kenaf. The dominant manufacturing processes are moulding/compression moulding. Injection and extrusion process are also used. The principal processors are Germany, France and several Eastern European countries (Poland, the Czech Republic and Slovenia).

Natural fibre reinforced plastics are mostly used because of their special material properties (low weight, low cost, sound insulation, good mechanical properties). But they can also help to reduce the environmental impact of a product. This area appears to be particularly rich in future market development opportunities.

8 Outlook

Last year, general uncertainties regarding the economic situation and political sphere were the major factors that unsettled industry as a whole and the market players in the composites market in particular. Despite its relatively modest size, the composites market is characterised by close international links. Brexit, to name just one of the most dramatic examples, was already causing enormous concern in many industrial sectors in 2019. Growing uncertainty and the resurgence of national protectionism and national aspirations of individual countries have significantly weakened and hampered intra-European trade. Trade disputes between the United States and China, as well as other countries, also negatively impacted global trade. A cautious approach and a reduction in the willingness to invest were already clearly noticeable last year.

From 27 January 2020, the novel coronavirus began to spread from Asia to Europe and the rest of the world. On 11 March 2020, the WHO classified the spread of the disease as a pandemic. The lockdown in Europe and Germany followed with serious restrictions for the population, industry and the economy in general. Its effects have been the most severe since the economic and financial crisis in 2008/2009.

All national governments, as well as the EU, are currently working to mitigate the consequences of the pandemic, or cushion its impact through various aid packages. For example, more than half of the EU's long-term budget – around EUR 1.8 trillion in total – will be devoted to forward-looking policy measures and promoting a sustainable and stable economic recovery. At the end of May, the German government passed the largest aid package in the country’s history – with budgetary stimulus of EUR 353.3 billion and guarantees totalling EUR 819.7 billion. To finance this, the federal government will take out new loans amounting to around EUR 156 billion. Other countries, such as Spain and Italy, are also putting together aid packages worth billions for their domestic economies.

During the preparation of this report, the number of cases in Europe has been increasing, in some cases dramatically. There is much talk of a second corona wave. Uncertainty and fears that the economy could fall sharply again are increasing. The official position, as things stand today, is that a renewed, comprehensive lockdown should be prevented at all costs.

The corona pandemic can certainly be seen as the decisive event that has triggered the current economic slump. Nevertheless, as described above, it should not be forgotten it hit an already uncertain economic environment and intensified its effects.

The most important areas of the economy for the composites industry are the transport sector, with the core areas of automotive, public transport, commercial vehicles and aviation, as well as the construction and infrastructure sectors. These two main areas together account for almost 70 % of the applications. In addition to other sectors, such as hotel/tourist accommodation, which is one of the most severely affected by the corona pandemic, the transport sector is also particularly affected. The ifo Institute has published its assessment of the situation in the automotive industry: “The coronavirus crisis has been a major blow to the automotive industry, which was already under attack in recent years through the ongoing diesel crisis, problems with the introduction of the new WLTP emission test standard, and weakening export markets.

Quarterly rates of change in price-adjusted sales compared with the same quarters of the previous year have been negative at -5 to -10 percent since mid-2018. In April and May, they then fell to record lows.”[1] According to ifo, the real sales declines in the automotive industry in the aforementioned period were almost 70%. As dramatic as the declines due to corona have been, the underlying trend must not be overlooked: “Developments on global markets are largely responsible for the sales performance of the German automotive industry. For example, exports have been falling drastically since mid-2018 due to the Brexit debate, trade conflicts between the US and China or the EU, and declining demand in China. At the end of January 2020, the coronavirus paralysed the automotive industry in China. (...) In April 2020, the balance of business expectations fell to an unprecedented low – even lower than during the financial crisis of 2009.”[2] In the meantime, however, despite all the uncertainty regarding further developments, the mood has become more optimistic again. Many experts see a significant recovery taking place during the current year, or at the latest in the coming

[1] https://www.ifo.de/branchenatlas/automobilindustrie

[2] https://www.ifo.de/branchenatlas/automobilindustrie

year. The basic prerequisite for this is, of course, that the situation does not deteriorate further and that markets pick up, especially in China and the USA.

However, it will probably be important for the automotive industry to respond decisively to the transition to more environmentally friendly modes of transport that was already emerging before the corona crisis began. This holds enormous opportunities for composites because it will involve a reconsideration of established construction principles. Familiar design concepts may be forced to give way to new, lightweight materials, load-bearing constructions or completely new aesthetics. Composites can be the ideal solution to all these needs.

Another core area for composite components, the aviation industry, has also been hit particularly hard. On 20 August this year, the Frankfurter Allgemeine Zeitung reported on the future prospects of the aviation industry under the headline “The aviation industry may not recover before 2024: Peter Gerber, Head of Lufthansa Cargo and new President of the German Aviation Association (BDL), had little encouragement to offer at his first appearance after taking office. He believes the corona crisis will be more extended than the downturns that followed 11 September 2001 or during the financial crisis. Indeed, the airline industry may have to wait until 2024 before it regains pre-crisis levels – and this with the proviso that corona infections can be managed from 2021 by means of drugs or a vaccine.”[3]

A further phenomenon that is becoming increasingly widespread in the industry seems likely to add to the major losses caused by travel restrictions: home office and online meetings have increased considerably during and after the lockdown. In many cases, companies have invested in the necessary infrastructure and are using it. According to the German government, “... in 2018 (...) only 5.3 percent of employees in Germany stated that they worked at home for at least half of their working days. In April 2020, 23 percent of employees were working predominantly in their home office.”[4] There are signs that employees are rethinking their work strategies and this is likely to have a significant impact on general travel activity. Prof. Dr. Norbert F. Schneider, Director of

[3] https://www.faz.net/aktuell/wirtschaft/krisen-sorgen-der-luftfahrt-erreichen-neue-flughoehe-16912536.html

[4] https://www.bundesregierung.de/breg-de/themen/coronavirus/bib-studie-eltern-1768676

the Federal Institute for Population Research, believes the corona era could also be used as a learning process for the organisation of work in the future: “It seems reasonable to assume that the experience of the lockdown will lead to a new balance between time spent in the workplace and in the home office in the long term.”[5]

The aviation industry – a key application area and one of the brightest prospects for the future until a few months ago – seems unlikely to be able to return to its previous level, at least in the medium term.

The largest application area for composites is currently the construction and infrastructure sector. This sector has been far less affected by the crisis than the transport sector and seems to be able to recover more quickly.

The ifo Institute also sees only moderate losses and good future potential in this sector: “Due to a significant share of value added and the rather moderate loss of business to date, the construction industry has an important role to play in stabilising economic development in times of the corona crisis. The construction industry is also currently struggling with the many negative effects of the coronavirus pandemic. However, a large part of the industry can look back on several years of strongly rising sales and considerable scope for price increases, so that at the beginning of 2020 many companies were in a satisfactory and in some cases even good financial condition. (...) And, last but not least, the massive increase in investment funds for public transport infrastructure by the federal government and municipalities provided considerable impetus in the civil engineering sector. Although there were signs of subdued market development in some of these areas in the medium term, the starting situation at the beginning of the year appeared surprisingly favourable.”[6]

Thus, there are indications that the construction industry – and with it the numerous composites applications – will be impacted to a lesser extent or for a shorter period of time. “The sectors will emerge from this situation at different speeds (...). The high street retail trade, for example, already had structural problems in the face of the growth in online shopping. The situation for hotels and restaurants will quickly return

[5] https://www.bundesregierung.de/breg-de/themen/coronavirus/bib-studie-eltern-1768676

[6] https://www.ifo.de/branchenatlas/baugewerbe

to normal, especially since more people are now taking holidays in Germany. The construction industry is likely to escape with minor grazes," said Michael Hüther, Director of the German Economic Institute. "To me, the automotive sector seems to be in a particularly difficult situation because the switch to alternative drive systems is placing considerable demands on this key industry in any case," he added.[7]

The future development of the composites industry will initially be determined by the overall economic trend over the coming months and years.

Beyond that, however, it will also be important to take advantage of opportunities that arise and actively present alternatives to established materials.

Composites construction materials are firmly established in some sub-sectors, yet still lack the high profile they deserve considering their outstanding properties. The industry must work together continuously to convince customers and highlight the advantages of these materials.

Greater efforts are also required in standardisation committees. In many cases, a lack of evidence and certification still stands in the way of their adoption by further sectors.

Structural changes, such as those pending in the automotive industry, always place a burden on established supply chains. However, composites have unique material properties that are useful in applications that extend well beyond technologies associated with the internal combustion engine. E-mobility does not signal the end of lightweight construction. It will just look different.

The economy is currently in the shadow of the corona pandemic. It is a huge crisis that is affecting almost every sector of industry. Nevertheless, it is also highlighting new possibilities and opportunities. Here, composites offer solutions that are as diverse as the materials themselves.

[7] https://www.businessinsider.de/wirtschaft/mobility/deutsche-autoindustrie-iw-umfrage