



The Market for Glass Fibre Reinforced Plastics (GRP) in 2019

Market developments,
trends, outlooks and
challenges

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The European Market for Glass Fibre Reinforced Plastics (GRP) in 2019

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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

Economic slowdown acts as a brake on growth

In 2019, after six consecutive years of growth in European GRP production, the trend for the market as a whole is expected to stagnate for the first time. Total production will thus remain stable at 1.141 million tonnes.

This stagnation will not affect all areas equally and there are again significant differences between the trends for the various sectors. While some areas – such as SMC/BMC, pultrusion and thermoplastic processes – continue to grow, production levels in other areas are declining.

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

On the user side, there are again some major divergences. For the second quarter of 2019, some strong declines are expected in the area of mobility and, more specifically, the automotive sector. These contrast with other segments which appear to be stable or even growing, e.g. infrastructure/construction and the electro/electronics industry.

Regionally, only Eastern European countries and Turkey are expected to see growth in the current year. In all other regions, it is assumed that market volumes will be stagnant or even suffer some declines.

Overall, it is evident that markets are currently being adversely affected by growing political uncertainties both within the EU and in international trade. The positive mood widely observed in Q1 2019 has now given way to a tangible sense of uncertainty. Macroeconomic events and processes, such as Brexit, trade conflicts, the protectionist policies of various countries and a slowdown in world trade are leading to greater uncertainty and generally declining expectations regarding the future development of the composites market. This is being exacerbated by widespread reductions in R&D expenditure. Above all, companies are currently trying to find ways to cut costs. The negative mood is

also being fuelled by growing stock market uncertainty, declining rates of investment and a generally turbulent economic climate – as well as continuing weakness and uncertainty in core markets, such as cars and commercial vehicles.

As a special segment of the plastics industry, the composites industry is often closely correlated with international trends and relationships. Here, it is clearly acting in unison with the global economy. When we look at the economy as a whole, particularly the industrial and manufacturing sectors, we can observe an increasingly negative assessment of the current business environment as well as more and more pessimistic expectations of future business activities. For example, the ifo Business Climate Index fell to 97.4 points in June. This is its lowest value since November 2014 (source: ifo Institute). The German economy is cooling noticeably. The composites industry cannot be immune to this macroeconomic trend.

2 Markets considered 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 an overall quantity and therefore stated separately.

Carbon fibre reinforced plastics (CRP) and natural fibre reinforced plastics (NRC) are 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. Turkish production is also considered but still stated separately due to the lack of data for long-term comparison.

3 Overall development

This year no growth is expected in European GRP production volume. In 2019, the overall European GRP market is expected to stagnate at an estimated 1.141 million tonnes (Fig. 1). This marks the end of six consecutive years of moderate growth.

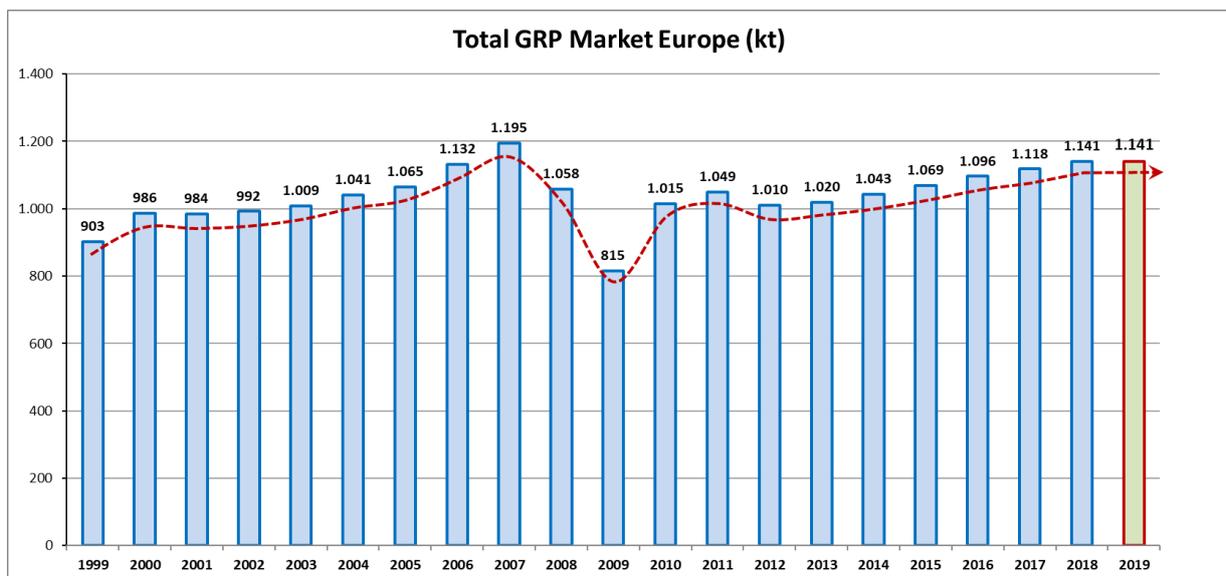


Fig. 1: GRP production volume in Europe since 1999 (in '000 tonnes) (2019* = estimate)

Although the overall values for the processes and regions included in this report are significant, their predictive power remains limited. As in previous years, the industry continues to grow or contract at different rates in different regions. Above all, however, there are significant variations in the growth trends for the different processes. When viewed in detail, the wide range of different materials and manufacturing methods used as well as the continuous development of new fields of application has led to the emergence of sometimes very different growth rates and expectations for future trends.

The two main areas of applications for GRP remain the construction/infrastructure and transport sectors (Fig. 2).

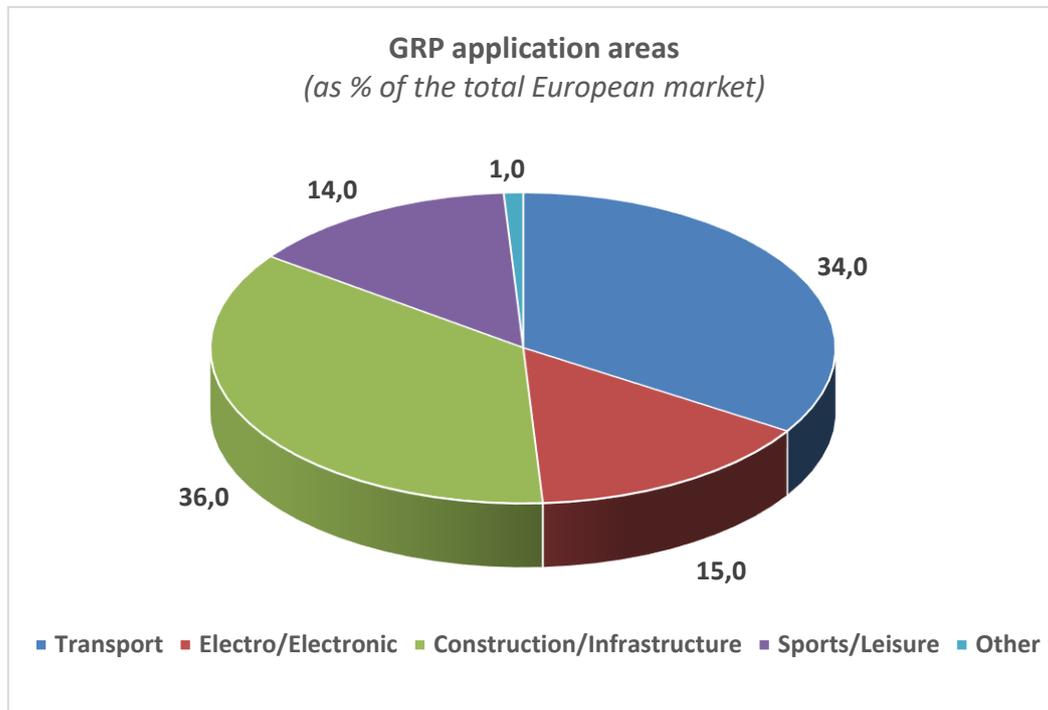


Fig. 2: GRP market by application areas in 2019 (as % of the total European market)

For the first time in many years, shifting market trends mean that construction/infrastructure is now a larger consumer of GRP than the transport sector. Once again, this shift impressively demonstrates that fluctuations within these two major industries also lead to fluctuations in the GRP sector. The current sales crisis in 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 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). Composites are already well-established in the aforementioned segments and, due to the high processing volume, no sudden changes in total production volume are to be expected over the coming years. Individual projects or new applications usually have

only a small effect on the total processing volume or overlap with/are cancelled out by developments in other application areas.

Despite the recent activities of a few individual companies – some of them major market players – the European market continues to be characterised by a large number of small and micro-enterprises. However, in many European countries, 80 - 90 % of the total volume is produced by just 10 - 20 % of the companies.

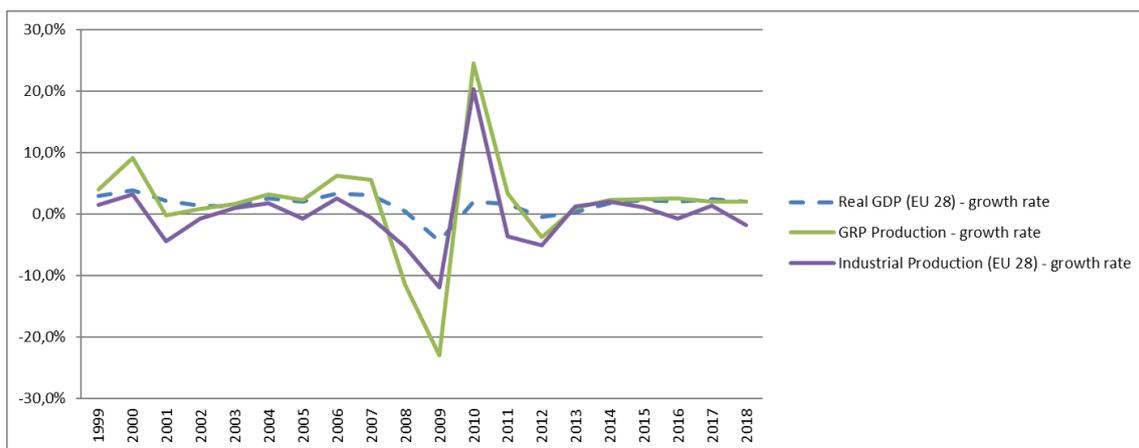


Fig. 3: Correlation between GRP production and the overall economy (Sources: EUROSTAT and own survey)

4 GRP production in Europe

In 2019, the European GRP market is expected to stagnate at a total volume of 1.141 million tonnes. The moderate average growth of approx. 2% p.a. witnessed over the past six years has not continued. Although the overall message is clear, however, it does not provide a detailed picture of the trends in the various countries/regions, application areas or production sectors considered here. These can differ widely. A detailed analysis follows from Section 5.

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 American (mainly USA/North America) and Asian (especially China) growth rates in percentage terms. Although the economies of these two regions have slowed somewhat, this trend is not expected to change fundamentally in the near future.

The presumed close correlation between GRP production and economic development is confirmed, e.g. by the gross domestic product (GDP) trends in these regions. Fig. 4 shows GDP growth for the United States, China and Europe. Although European GDP has also grown significantly, this growth has been less strong than in the other two regions – especially in the last few years.

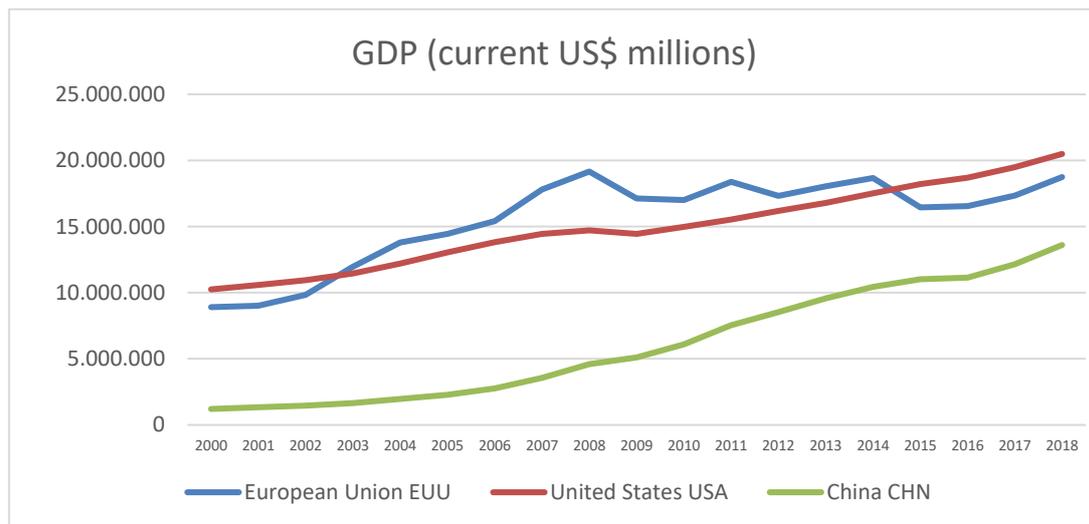


Fig. 4: World Development Indicators - GDP (current US\$ millions)

Reasons for this slower growth include the migration of certain manufacturing processes and methods, but also the outsourcing of production for commodities with often low profit margins. In addition, some specific application and customer industries are growing more dynamically in other regions of the world than in Europe. Other industries, e.g. most recently the automotive industry in Germany/Europe, 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.

5 Trends in the development of processes/components

Table 1 shows the trend in the production volume of essential processes/parts for GRP production over recent years. The names of the individual segments are not always very 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 (kt)	2017 (kt)	2018 (kt)	2019 (kt)
SMC	198,0	202,0	204,0	205,0
BMC	76,0	78,0	81,0	82,0
Σ SMC/BMC	274,0	280,0	285,0	287,0
Hand lay-up	140,0	140,0	140,0	139,0
Spray-up	97,0	98,0	99,0	98,0
Σ Open mould	237,0	238,0	239,0	237,0
RTM	141,0	146,0	148,0	148,0
Sheets	89,0	93,0	96,0	94,0
Pultrusion	50,0	53,0	55,0	56,0
Σ Continuous processing	139,0	146,0	151,0	150,0
Filament winding	80,0	78,0	79,0	78,0
Centrifugal casting	68,0	67,0	69,0	68,0
Σ Pipes and Tanks	148,0	145,0	148,0	146,0
GMT/LFT	140,0	145,0	152,0	156,0
Others	17,0	18,0	18,0	17,0
Sum:	1096,0	1118,0	1141,0	1141,0

Table 1: GRP production volumes in Europe according to processes/components – current year and the three previous years (kt = kilotonnes, 2019 = 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, the absolute figures somewhat obscure the long-term trend seen in Fig. 5. It shows that the trend has steadied despite a changing 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. There is also clear growth in the area of RTM technology (resin transfer moulding), particularly in thermoplastic processes. Growth rates in this segment have been far outperforming the general market for several years and this trend continues unbroken.

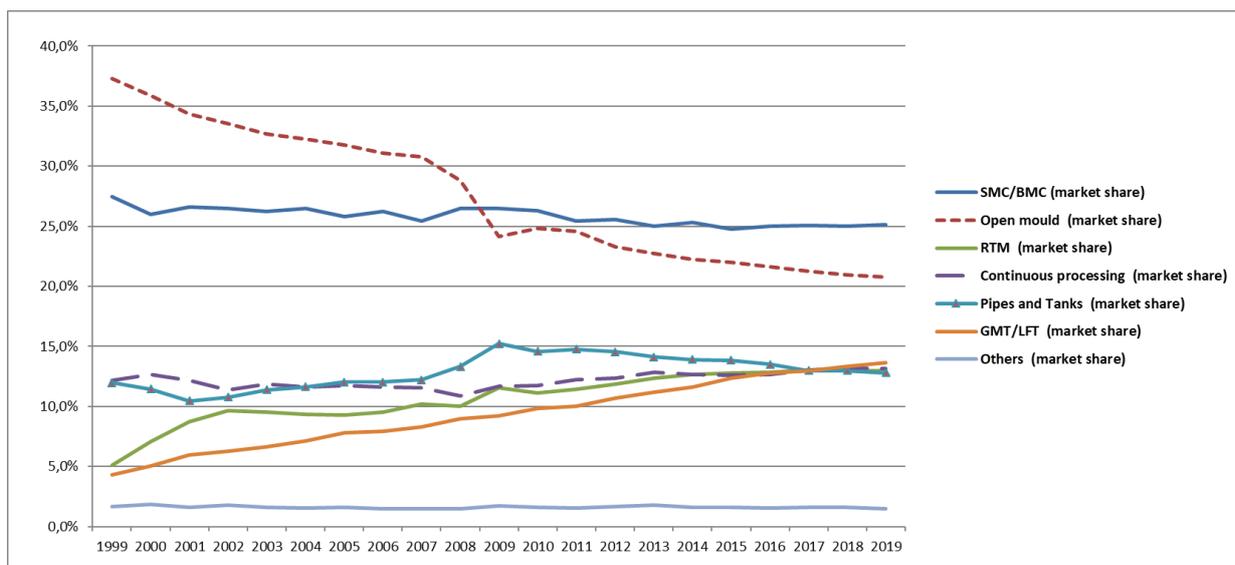


Fig. 5: Long-term trends for GRP market segments (share of total market, 2019 = estimated)

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. Semi-finished products manufactured using pressing and injection moulding processes are turned into components which are used primarily in the electro/electronics and transport sectors, especially in the automotive industry.

This year, growth in the SMC/BMC sector is slightly slower than last year at less than 1%. However, this is still faster than the rate for total GRP production.

Total production volume this year will be 287,000 tonnes. SMC is by far the larger of the two market segments. At 205,000 tonnes, it accounts for nearly three-quarters of production volume. However, as was the case last year, the BMC sector is again growing much faster (1.2%) than the SMC sector which is growing at only about 0.5%. Total BMC production volume is 82,000 tonnes.

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, cases, and exterior components in the commercial vehicle and automotive sectors.

The strong interest in semi-finished products and the processing technology observed in last year's report 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 in the current half-year. This year's growth figures – again slightly above-average – could be the first confirmation of this suspicion. However, once again, no significant increase in production volume has been reported this year (yet). Due to the already very high production volume – this market segment in Europe is significantly larger than, for example, global CRP production – it seems unlikely that the total volume will increase dramatically.

Negative effects caused by declining production volumes, especially in the area of transport/automotive, must also be expected in this segment. At the moment, robust and even slightly increasing production volumes in other segments, particularly in construction and electro/electronics, seem to be compensating for these declines.

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 become widely used in the long term.

5.2 Open processes

With total production of 237,000 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. 5 shows, however, its share of the total market has fallen from over 37% (in 1999) to just 20.7% this year. Open processes have thus been the fastest declining segment in Europe over the past 20 years. A slight decline of 0.8% is expected in 2019. As a result, open processes continue to underperform the overall market trend.

Despite further anticipated declines, open processes will continue to be an important area of GRP production over the coming years. 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.

Increasingly strict statutory processing regulations, especially for unsaturated polyesters/styrene, and changes to the limit values for other raw materials are making production in Europe ever more costly and difficult. Further tightening cannot be ruled out in the next few years. This increases the pressure on component manufacturers still further. 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.

In addition to the problem of emissions, open processes (open tool/open mould) and manual processing can sometimes produce inconsistent quality in series or near-series scale production. This combination of factors often leads manufacturers to seek out substitute closed methods. In addition, there is a noticeable migration to – sometimes very modern and well-equipped – production facilities in non-European countries. Overall, the strong declines in this segment have been compensated for by other processes. Consequently, the overall market has continued to grow over recent years. Above all, the rapid rise of RTM technology seems to indicate that it has been adopted as a substitute for a significant proportion of production from the area of open processes.

5.3 RTM

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 several years of continuous growth, production has stagnated in the RTM segment this year and remains steady at an expected 148,000 tonnes. However, in general, RTM technology has grown much faster than average (Fig. 6).



Fig. 6: Production volume in 000 tonnes (kt) and market share of RTM technology

RTM's market share has increased significantly in the last 20 years. Since 2017, however, this trend has slowed and growth rates for the segment now correspond largely to those for the overall market. Nevertheless, this impressive increase in production must not be overlooked. In 1999, RTM processes accounted for just 46,000 tonnes of production. Today, this has more than tripled with production totalling 148,000 tonnes.

RTM technology can be used for production on a very wide range of scales – 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. Production volume has increased considerably, not least because of this technology's flexibility and range of potential applications.

It is noticeable that RTM technology has drifted out of the focus of the most innovative processes in recent years. For many years, it was considered the processing technology of the future, including for series production in the automotive sector. In this regard, RTM has been adopted in just a few isolated cases and, even then, only for small to medium batch sizes. The specifics of the RTM process make it ideal for manufacturing highly stressed components. In large-scale series production, thermoplastic processes seem to be enjoying particular success at the moment. This is not intended to be an argument against future growth for this group of processes – only to emphasise that manufacturers have to carefully consider which process is most viable or produces the best results. Almost all the methods described here have unique properties that must be checked against the relevant requirements.

5.4 Continuous processes

The production of GRP components using continuous processes (pultrusion and flat panel production) has fallen by 0.7 % in 2019. While last year's growth was still clearly above average at 3.4%, production of flat panels is expected to fall slightly by around 2.1% this year. Pultrusion technology, in contrast, will continue to grow at a rate of almost 2%. Total production volume for 2019 is expected to be approx. 150,000 tonnes.

Production in the larger of the two market segments, flat panels, has fallen to 94,000 tonnes. These products have been used in vehicles for many years, primarily in truck side panels, caravan superstructures or the conversion of commercial vehicles. They are supplemented by applications in the area of facades. Exports to the USA for recreational vehicles and commercial vehicles are the primary area where falls are expected. However, there are also initial indications of a decline in commercial vehicle production in other countries/regions. Thus, a moderate decline is expected in this segment.

Production using pultrusion technology will grow to a total of 56,000 tonnes this year. This is the seventh consecutive year of production growth in the segment – albeit at a relatively low level. Pultrusion processes account for approx. 5% of total European GRP production.

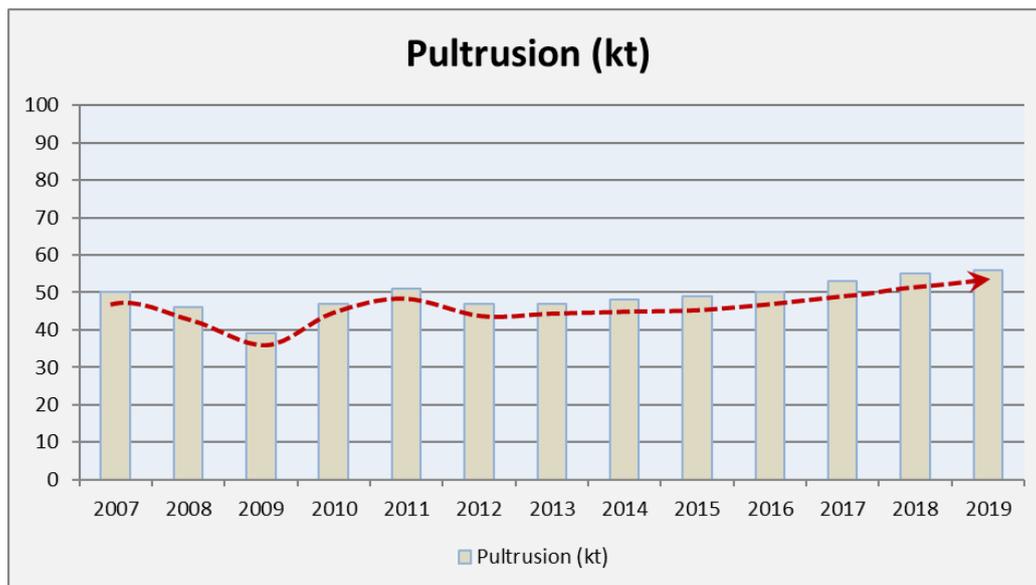


Fig. 7: Market trend for pultrusion in 000 tonnes (kt)

Increasingly, in recent months, pultrusion technology has attracted the attention of many processors/users of GRP profiles as well as others outside the industry. This is due to a range of innovations and enhancements – accompanied by their corresponding marketing campaigns.

In the last market survey by Composites Germany (see above), almost half the participants assumed that the pultrusion industry would see continued growth. Only 3% of respondents expect a decline.

Within the pultrusion industry, the construction and infrastructure sectors are considered the key 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.

The necessary general industrial approvals and norms/standards have not yet 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

Production in the market segment of GRP pipes and tanks, manufactured using centrifugal casting or filament winding processes, is falling slightly. A decline of 1.4% is expected for the current year. The market share of these products in the overall GRP market has fallen slightly from 14.8% in 2011 to 12.8% in 2019 – despite absolute growth in some of the intervening years.

The market is dominated by a few large manufacturers not least because of the relatively high throughput quantities – at least in terms of the GRP industry.

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.

As in the pultrusion segment, standardisation can act as both a driving force and a brake on further development. One example is the amended drinking water approval which has made the use of GRP pipes more difficult. This segment is also subject to strong material substitution effects, e.g. by non-reinforced plastics or other material systems.

In plant construction, GRP has numerous potential advantages over other construction materials, especially its excellent material properties in areas where long service lives/operating times are essential and materials are subject to mechanical and/or media loads. In addition to requirements resulting from standards, the main obstacle to the adoption of GRP products is operators’ and planners’ ignorance about 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 the materials.

The AVK is currently running several campaigns aimed at closing the above-mentioned gaps in norms and standards and gaining the necessary approvals for these materials. It remains to be seen whether GRP can compete with and win out against established materials in the medium term – or whether it will be possible to improve or expand the knowledge of decision-makers in this area. The expansion of the overall market for GRP will require the cooperation of all market players. The goal is to pave the way for a fundamental acceptance of the material, not to argue for or against specific products.

5.6 GMT/LFT

Glass mat reinforced thermoplastics (GMT), long fibre reinforced thermoplastics (LFT) and continuous fibre reinforced thermoplastics are the only thermoplastic materials included 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.

In 2019, the market for GMT and LFT continues to grow at an above-average rate of 2.6% having already grown at 4.8% in 2018. From a long-term perspective, this market segment has almost quadrupled since 1999 – reaching a volume of 156,000 tonnes in 2019. During that period, its share of the total market has risen from 4.3% to over 13.7% (see Fig. 8).

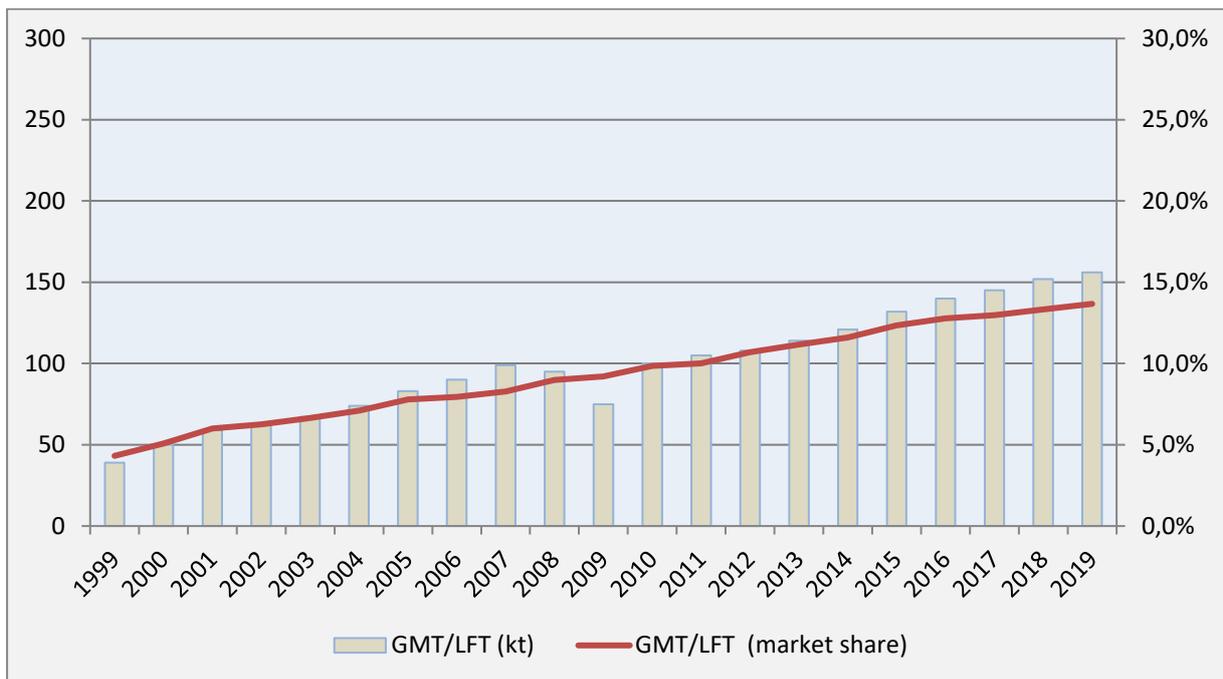


Fig. 8: Growth in the market for GMT/LFT as a share of total European GRP production volume

LFTs are the largest category of thermoplastic materials. For some years, however, tapes and pre-consolidated, flat semi-finished products (“organosheets”) have increasingly become the focus of attention – the latter particularly in relation to the hybridisation of manufacturing processes, e.g. combination with injection moulding and forming.

Projects in the automotive industry, and some in the electronics sector, are the primary growth drivers for thermoplastic materials. Thermoplastic materials have many advantageous properties in terms of ease of processing/cycle times and recycling. They also combine well with other materials. This often makes them the material of choice. The pressing and injection moulding techniques for manufacturing/processing components are well-understood in the industry and also used for other materials. In principle, they can even be used for large series production of components in the range 100,000+. Typical 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 fields 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, especially in transport but also in the electro/electronics sector.

6 GRP production in 2019 by country

As mentioned in the introduction, the market trends within Europe vary widely from country to country. While the overall market stagnated year-on-year at 1.141 million tonnes, growth rates in the countries reviewed in this report ranged from -2.55% to +4.35%. Table 2 shows the trends for each country/region in detail.

	2015 (kt)	2016 (kt)	2017 (kt)	2018 (kt)	2019 (kt)
UK / Ireland	150	152	153	155	155
Belgium / Netherlands / Luxembourg	44	45	46	46	45
Denmark / Sweden / Norway / Finland	39	40	40	40	39
Spain / Portugal	156	158	161	167	166
Italy	150	154	158	162	161
France	108	110	112	115	114
Germany	212	220	226	229	225
Austria / Switzerland	18	18	19	19	19
Eastern Europe *	192	199	203	208	217
Sum:	1069	1096	1118	1141	1141

Table 2: GRP production volumes in Europe itemised by country/group of countries (kt = kilotonnes / 2019 = estimated / Eastern Europe* = Poland, Czech Republic, Hungary, Romania, Serbia, Croatia, Macedonia, Latvia, Lithuania, Slovakia and Slovenia)

The key fact here is that – of the countries included in this report – only Eastern European nations registered any growth this year. Production in the UK/Ireland and Austria/Switzerland was stable. All other countries must expect production to fall this year.

The largest European country in the GRP/composites market continues to be Germany with a total production volume of 225,000 tonnes. The dynamism of the German economy has been declining over recent years. This trend has continued and now turned negative for the first time. Germany has thus lost a small proportion of its market share compared to the other countries but still maintains its leading position (see Fig 6).

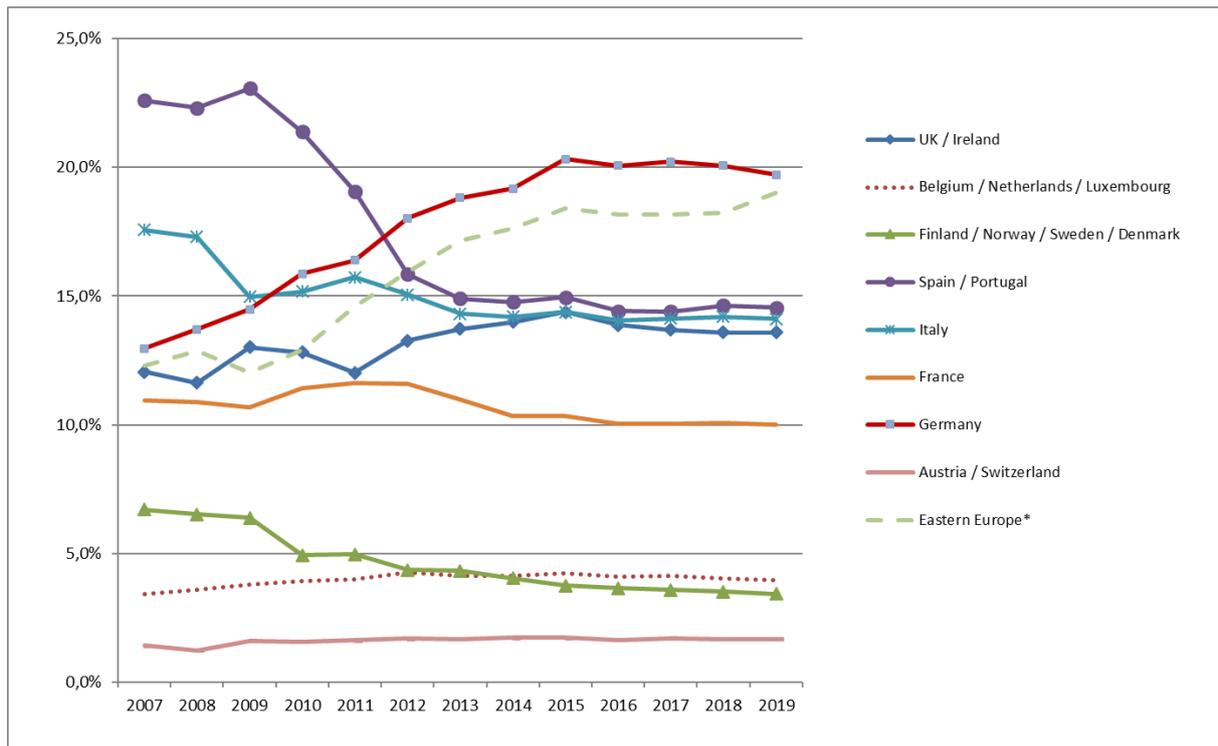


Fig. 9: Market share of European GRP production by country (date: 2019)

The massive drop in production volume, especially in Italy and Spain/Portugal, during the economic and financial crisis is easy to identify. The industry has yet to recover fully from these declines. Since 2012, however, production volume has clearly stabilised.

Market growth in Eastern European countries is again well above average at 4.3%. Unfortunately, no detailed analyses are available for the individual countries.

The Turkish trade association is reporting growth of 3.5% to a total volume of 250,000 tonnes. As a result, Turkish GRP production is again stronger than in most European countries. The applications differ from those in the other countries included in this report: 48 % of production volume is used in the construction sector and manufacturing

pipes and tanks. The automotive and transport sectors account for 29 %. Wind energy is the third largest application area with 10 %.

A look at the figures by country highlights the varying growth rates within Europe, although this year the general mood is subdued. These variations are due to differences between regional markets. For example, GRP processing in Germany focuses heavily on the transport sector and the electro/electronics industry. The market structure is different in Turkey (principally infrastructure) or Norway/Sweden (primarily oil and gas industry). When analysing potential trends, it is important to look at each market individually.

7 Other composite materials

7.1 Carbon fibre reinforced plastics

Although current media reports and presentations at many conventions and trade fairs may create a different impression, GRP continues to be the largest material group in the composites industry by some distance. Glass fibres are used for reinforcement in over 95% of the total volume of composites (short and long fibres, rovings, woven fabrics, mats ...). In 2019, global demand for carbon fibre reinforced plastics (CRP) was estimated at 141,500 tonnes compared to 125,500 tonnes in the previous year. That corresponds to growth of 10.1% - a slightly lower rate than in recent years (*Source: CCEV*). Worldwide, CRP accounts for 1-2 % of the market for fibre reinforced plastics.

7.2 Short glass fibre reinforced thermoplastics

As already mentioned, there are some clear differences between the material properties of short glass fibre reinforced thermoplastics 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 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. At approx. 1.544 million tonnes, the European market for thermoplastic, short glass fibre reinforced compounds in 2018 (*Source: AMAC*) was much larger than the GRP market considered here over the same period. Compared to 2017 – market volume 1.47 million tonnes – the market grew by 5 % and thus much more rapidly than all the other sectors reviewed here. Moreover, the rate of growth is significantly faster than in previous years, once again confirming the importance of this group of materials. Polyamide is the dominant matrix material in this segment, followed at some distance by polypropylene. The picture is different in the area of LFT described above. Here, over 90% of the material used is PP.

Applications are primarily in the automotive sector but also in the electro/electronics sector and consumer goods.

7.3 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 a recent AVK survey within the NRP sector, this market segment primarily uses thermoplastic materials, 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 (*Source: nova-Institut GmbH*).

The largest application area 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

In 2019, for the first time in six years, no growth is expected in the GRP market. The mood within the sector, confirmed by the Composites Index produced by Composites Germany, is currently strained. This index is based on a survey of several hundred stakeholders in the German and European composites industry (Fig. 9).

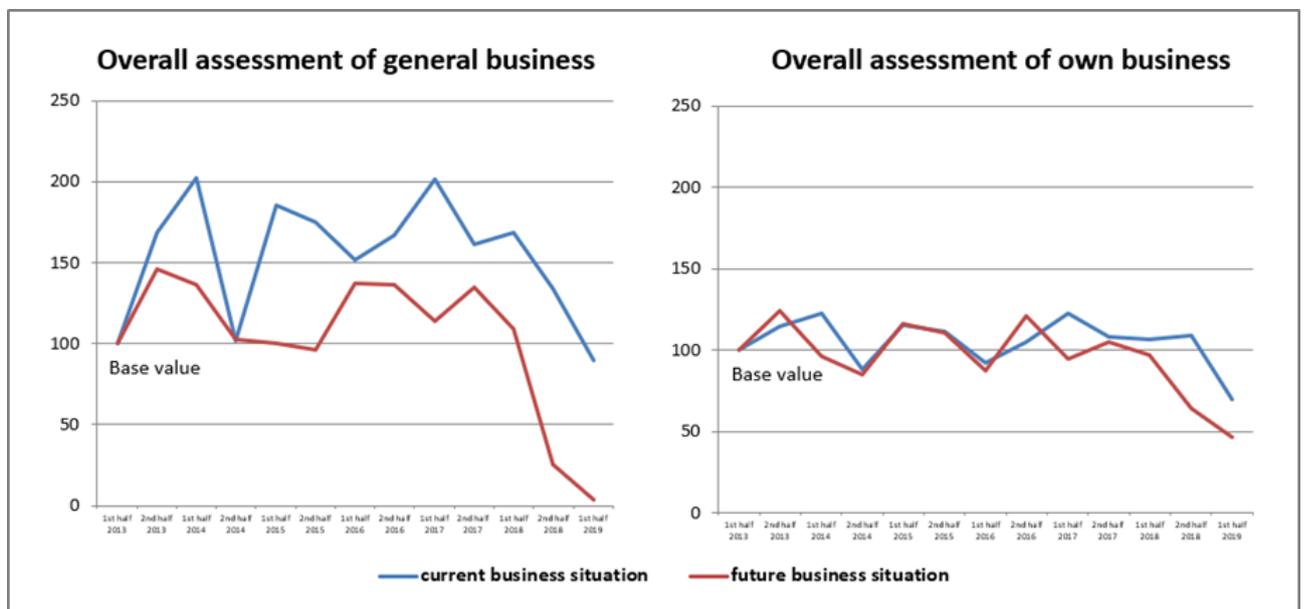


Fig. 10: Composites Index 1-2019 (source: Composites Germany)

The importance of both the market changes highlighted here and the Composites Index should not, however, be overstated. The overall figure for Europe is a strongly aggregated value which can obscure the reader's view of isolated, positive developments which can be counterbalanced by other negative trends. The Index has been produced since 2013. The second half of 2013 to 2015 marked the high-water mark of the industrial boom with exceptionally strong satisfaction values and higher than average expectations for the coming years.

The composites market is currently in a phase of slower growth or even stagnation. In other words, it is closely tracking the growth of the overall economy. The GDP indicators for Europe as a whole and many of its national economies are currently trending downwards.

This is due to a general lack of economic visibility. Brexit (whatever form it may take) seems imminent and is creating massive uncertainty in many branches of industry. This is significantly weakening intra-European trade. In addition, trade disputes between the United States and China, as well as other countries, are negatively impacting global trade. Countries and application industries with large export surpluses, such as the automotive sector or the mechanical engineering in Germany, but also in other countries, will be the hardest hit by any slow-down. This not only affects OEMs, but the entire supply chain. While many businesses reported stable order books in the first half of the year, significant declines are anticipated for the second half of the year.

Although the construction sector may be less affected by cuts, it can be assumed that investment activities will be reduced due to declining cash flows. In Germany, for example, the government is discussing the possibility of investment packages to stimulate the flagging economy. It remains to be seen whether these materialise, and the extent to which conflicts in the area of economic policy become further inflamed.

However, it is clear that the automotive sector, one of the central pillars of the composites industry, is now undergoing a massive transformation – with changing material requirements, new challenges in the area of drive technology and construction, but also innovations that have much more radical implications, such as autonomous driving systems.

For many years, lightweight construction was one of the key considerations in the automotive and aerospace sectors. Especially in the automotive sector, a paradigm shift is now underway. Lightweight construction is no longer the dominant issue when selecting materials. Other criteria, such as possibilities for integrating components into existing systems, reducing the complexity of the manufacturing process, etc., are becoming increasingly important. As well as these requirements which affect the vehicle itself, there are also changes in the periphery.

In the future, cars should be able to communicate with each other and drive autonomously in increasingly dense traffic. Technologically, this is unimaginable without investment in the necessary infrastructure – and this does not yet exist. 5G is the mobile communications network of the future and is expected, among other things, to facilitate the permanent networking of vehicles. But this will require a very extensive and completely new technological infrastructure. The new transmitter masts will have to be positioned much more closely to each other than those for current networks – so although their bandwidth is much higher, their range is significantly shorter. The new antennas will have to be integrated into the already very limited space available in cities, without interfering with each other. GRP offers many opportunities here in a rapidly expanding market.

Other important areas include the personal mobility, public transport, commercial vehicle and aerospace sectors.

Significant growth is expected in all these areas. Cities continue to expand. It is becoming ever more difficult to satisfy people's mobility needs. New concepts are required and public transport will play an important role. GRP products have enjoyed considerable success in this sector for many years. A huge increase in parcel deliveries and other logistics services over recent years has generated continuous and rapidly growing demand for logistics solutions. Commercial vehicles look set to play an increasingly important role. Lightweight materials, such as composites, help manufacturers to reduce the weight of their vehicles and thus save fuel or increase range. Composites can be an excellent solution in this area. Passenger numbers and freight volumes are rising steadily in the aviation sector, too. Despite the concerns about the growth of air traffic and its impact on the environment, there is strong demand for aircraft. These must be as efficient as possible, so the development of extensive lightweight design concepts is essential. Composites have an important role here.

Pipe systems are another very large potential market. In both new systems and, especially, sewer renovation works, GRP offers a wide variety of possibilities and is an interesting alternative to conventional materials. Despite this, suspicion of "plastic" runs deep and it is very difficult to persuade designers to adopt new materials in a generally conservative sector like the construction industry. This applies, for example, to the

renovation of bridges and other buildings as well. According to a report in the newspaper “Die Welt” (source: “Die Welt” - <https://www.welt.de/wirtschaft/article187446704/Infrastruktur-In-diesem-miesen-Zustand-sind-Deutschlands-Bruecken.html>), the German Federal Highway Research Institute (BASt) and the German Federal Ministry of Transport and Digital Infrastructure found that only around 50% of bridges in Germany are in a satisfactory condition.

Nearly 40,000 bridges or over 51,000 bridge sections require regular attention – resulting in high servicing and maintenance costs. There is also the financial burden of bridges which already require renovation and modernisation. The potential for GRP is enormous, especially in load-compliant design due to its excellent durability, low maintenance requirements and corrosion resistance. However, many projects base their calculations on short-term figures and short life cycles. GRP bridges are often more expensive to build but last much longer and require virtually no maintenance compared to other materials. The short-term nature of calculations based on just a few years (often an unrealistic assumption) has resulted in the rejection of GRP elements. This underlines the importance of lobbying more intensively for these materials.

The final example here is that of renewable energy. Composites have been proving their outstanding properties in wind turbine blades for many years. Fibre reinforced plastics are also found time and again in solar energy solutions and concepts for tidal power stations. Their advantage here, in addition to the properties already described, is that they are electrical insulators and can be easily transported and installed due to their low weight.

These are just a few examples of technologies with the potential to drive future trends in the composites sector. In summary: with the GRP (or composites) industry currently in a general state of stagnation, it would be unrealistic to assume unbridled, continuous growth. Phases of stagnation, or even recession, are a natural part of the economic cycle. In some areas, the first reactions to it can already be found. However, there are clear signs that the economy is slowing and the composites market will also be affected. For example, the number of mergers, acquisitions and sales has increased significantly over the last two years. Due to their versatility and exceptional ability to combine with other materials, GRP and other composites offer outstanding potential in

many applications. However, awareness of the materials is still too low for them to be widely considered by the responsible decision makers. This must change because composites are a good, if not better, choice than many of their rivals. If customers can reassess these materials and composites become subject to standards/norms, then market growth (at an even faster rate than already experienced) is assured for the coming years.