

Sustainability of fibre reinforced plastics (FRP) – A few facts:

1. What are fibre reinforced plastics?

- Fibre reinforced plastics (FRP) constitute a special segment of the plastics industry.
- Our modern life would be inconceivable without plastics. Applications such as today's packaging materials, automobiles, aviation, and modern medicine would be unimaginable without them.
- FRP combine reinforcing fibres (such as glass fibres, carbon fibres, natural fibres, etc.) with the so-called matrix (plastics such as epoxy, UP resins or amino resins) and various additives.
- Different combinations of these components during production (by various techniques) give rise to component parts/materials with highly variable properties that may be adjusted depending on the area of application.



2. What are the distinctive characteristics of FRP?

- FRP have a variety of specific features, only some of which should be mentioned in this context:
- FRP may be adapted to the respective requirements by using specific resins or fibres in a certain way.
- They are very light compared to other materials. The weight may be drastically reduced without compromising the strength of the component part. On the other hand, component parts may be made much thicker without risking a weight increase.
- In many sectors of industry, lower weight reduces installation costs (including transport) – light-weight construction noticeably facilitates the transport of large-sized component parts in particular.
- Durability / longevity / maintenance - FRP are corrosion-resistant and largely weather-resistant. Besides, they exhibit excellent chemical resistance with respect to a variety of chemicals.
- Freedom of design: Corresponding processing techniques make it possible to produce even component parts with a complex geometry or a relatively large size (such as underbody elements in automotive construction) 'in one shot' respectively in one piece.

3. How about the areas of application for FRP?

- Fibre-reinforced plastics are broad in scope.
- In 2010, a total of approximately one million tons of FRP will be produced in Europe*.
- Generally, both very small-sized parts, for instance for medical purposes, series-produced parts for the automotive industry, or large-sized components, such as rotors for wind turbines with a length of about 60 metres may be made of FRP.
- Construction and transport are the leading application industries. Typical areas of utilisation include, for instance, pipes, tanks, profiles, or sheets as well as frame constructions for trucks.
- Next in line, as far as areas of application go, are the sports and recreation sectors as well as electrical and electronics industries. In this context, FRP are used, for instance, to make skiing boots, Nordic Walking poles, or to manufacture control cabinets or switches.

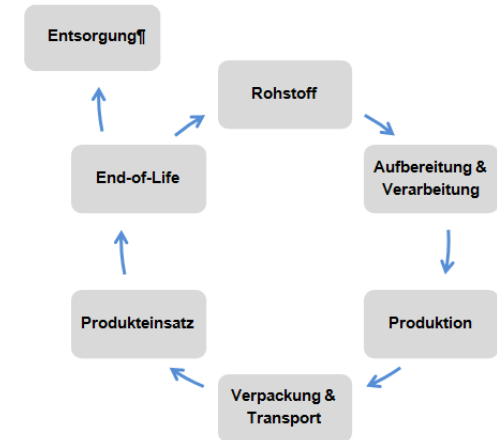


4. What does sustainability mean?

- In the public debate, the term 'sustainability' is used quite inconsistently. Besides, it is often confused with other terms or concepts. This problem is aggravated by the fact that the sustainability concept is abridged in many debates and, for instance, equated with the word 'recycling'.
- This means that there is no uniform concept of sustainability; there may even be a totally incorrect one.
- The German Council for Sustainable Development that was appointed by the Federal Government summarises the basic principle of sustainable development as follows: ***"Sustainable development means that environmental aspects are to be considered equally and on the same level as social and economical factors. Thus, 'fit for the future' means that we must leave behind an intact ecological, social, and economic system for our children and grandchildren. One is inconceivable without the other."***
- This makes it necessary to consider a variety of factors besides ecological ones.

5. Can fibre reinforced plastics be 'sustainable'?

- Yes! Various examples and studies demonstrate that reinforced plastics, for instance with regard to the amount of CO₂ needed, may be much more effective than other materials.
- An assessment of the entire life cycle of a given product (see diagram) shows that the manufacture, utilisation, and disposal of a GRP footbridge (glass fibre reinforced plastic), for example, is associated with a noticeably lower CO₂ consumption than that of a concrete bridge.
- Another example includes low-weight vehicles and aircraft made of FRP parts. This also reduces fuel consumption respectively increases the cruising range available with the same amount of fuel.
- Thanks to the high corrosion resistance of FRP, their utilisation, for instance for offshore purposes, is significantly less costly than steel, since they reduce the need for demanding repair work.



6. Is it true that FRP cannot be recycled?

- The considerable advantages regarding the longevity of FRP may, indeed, turn into a challenge. Especially so-called thermosets form an extremely hard composite that is very difficult to break up.
- High mechanical forces are required for shredding.
- A process is now available to fully recycle disused GRP waste. This system was introduced to the market under the 'CompoCycle' label (www.compocycle.com).

7. What remains to be done?

- Fibre reinforced plastics are a ‘comparatively recent’ invention. In relation to other materials, such as steel or wood, we are still in the early stages of utilisation and development. Much remains to be done. We are convinced, however, that FRP, especially in the face of stringent ecological requirements, will turn into a leading material of the 21st century that will be indispensable in most if not all branches of industry.
- We are convinced of the advantages of our materials for a variety of purposes, also considering optimum utilisation of the available finite resources. It is unfortunate that our materials are more or less unknown to many. This is one of our most important future tasks within this sector of industry. We should unfailingly demonstrate the benefits without neglecting potential problems.



8. Are FRP ‘better’ than other materials?

- We are convinced that no material is ‘better’ than any other. FRP may, in some cases, have certain advantages over other materials, such as steel or aluminium; although many companies have yet failed to acknowledge or fully utilise these advantages.
- Either there is a lack of necessary knowledge regarding the materials, or the corresponding machines at the factory are designed for metals only.
- Even though FRP are not generally ‘better’ materials, many companies would do well to familiarise themselves with this topic, which might benefit production and manufacturing costs, too.
- To the best of our knowledge there are tremendous opportunities in combining various materials. We would therefore like to get away from pure material assessments based on the question of „What can the material do?“ Instead we would prefer a product-oriented approach, in which case the question is: „What should the resulting product be able to do respectively what are its desired characteristics?“ This leads to the next question regarding the material or combination of materials that is best suited to meet the pertinent requirements.

9. Where do I get thorough information?

- The AVK – Industrievereinigung Verstärkte Kunststoffe has established a special expert task force ‘sustainability’. Many experts in this group are focusing exclusively on this topic.
- Information is obtained, current developments are analysed and corresponding concepts for the future are developed.
- For a detailed report regarding the sustainability of fibre reinforced plastics please see the website below.
- If you have any queries, please do not hesitate to contact us:

Arbeitskreis Nachhaltigkeit

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* Europe in this context includes Belgium, Denmark, Germany, Finland, France, Great Britain Ireland, Italy, Croatia, Luxembourg, Macedonia, the Netherlands, Norway, Austria, Poland, Portugal, Rumania, Sweden, Switzerland, Serbia, Spain, the Czech Republic, and Hungary