

USE OF COMPOSITE MATERIALS IN ELECTRIC REMOTE CONTROLLED CARS

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Abstract: The paper presents different types of remote controlled cars being used today for small scale racing. After a brief overview on main chassis models used today it describes the main areas where composite materials are being used and future developments.

Keywords: composite materials, chassis, remote control, carbon fiber

1. INTRODUCTION

Many people consider a remote control car a simple toy found in any supermarket or toy store. In fact from 1970 when IFMAR (International Federation of Model Auto Racing) was founded the word “remote controlled car” took another meaning. It is important to separate remote control cars being used for racing or as study platforms,

even hobby grade from commercial available toy remote controlled cars found in superstores. With the development of new technologies and access to exotic materials the evolution of this industry was amazing during the next 50 years. In Fig. 1. four of the most common electric chassis types used in remote control racing are represented. The two main categories are on road and off-road chassis, with 2 wheel drive or 4 wheel drive.

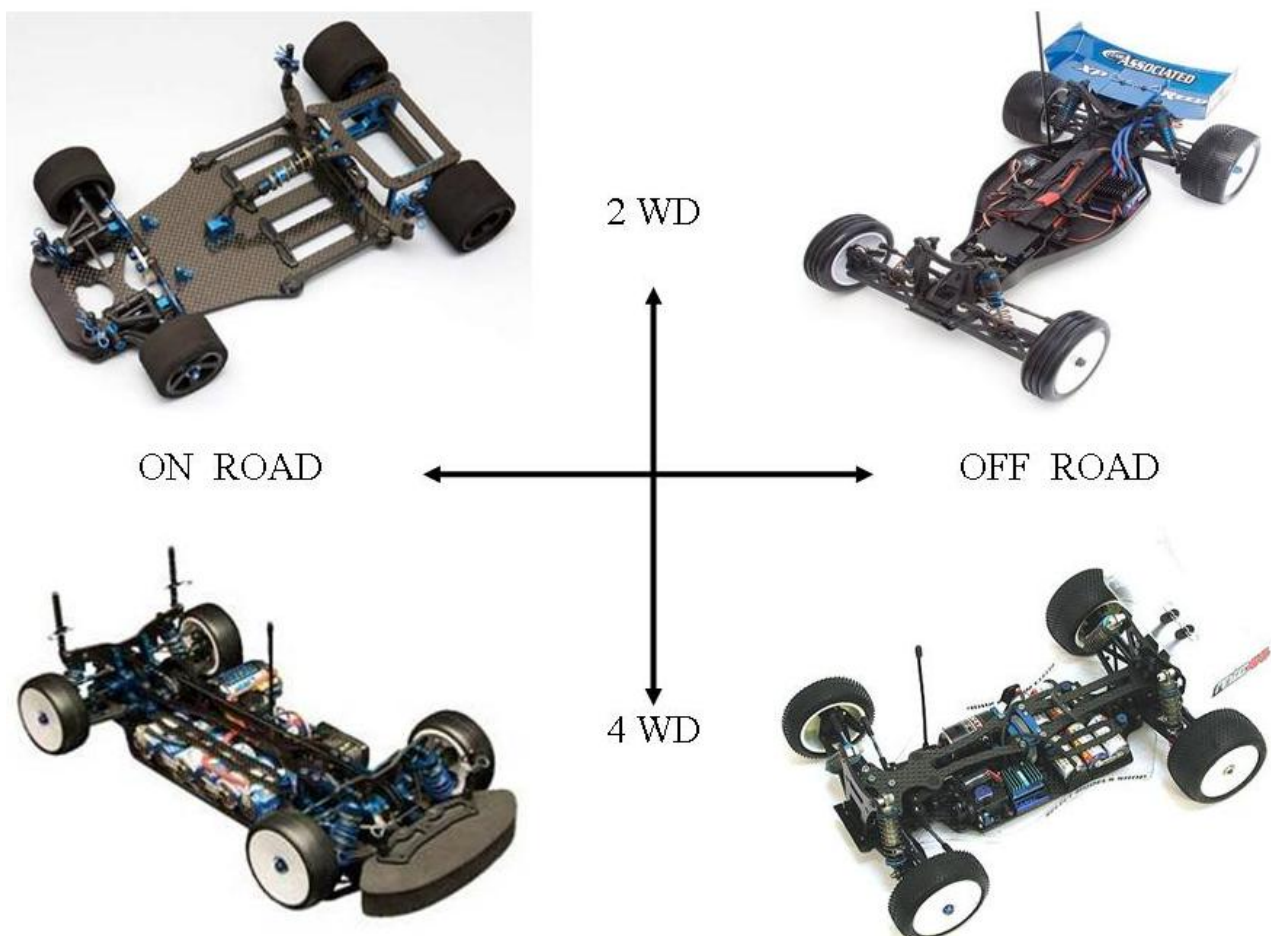


Fig. 1. Electric chassis types

2. CHASSIS TYPES OVERVIEW

To better understand what materials are used in a remote controlled car chassis is important to know the main components. A typical 2 wheel drive chassis is composed from as seen in Fig. 2 . : main chassis plate, lower back plate, top plate, rear axle, front

axles and one or more shock absorbers. For this type of chassis is very common direct transmission, for off-road cars a special gearbox and transmission is used. With the appearance of new brushless motors and Li-po batteries new materials had to be introduced.

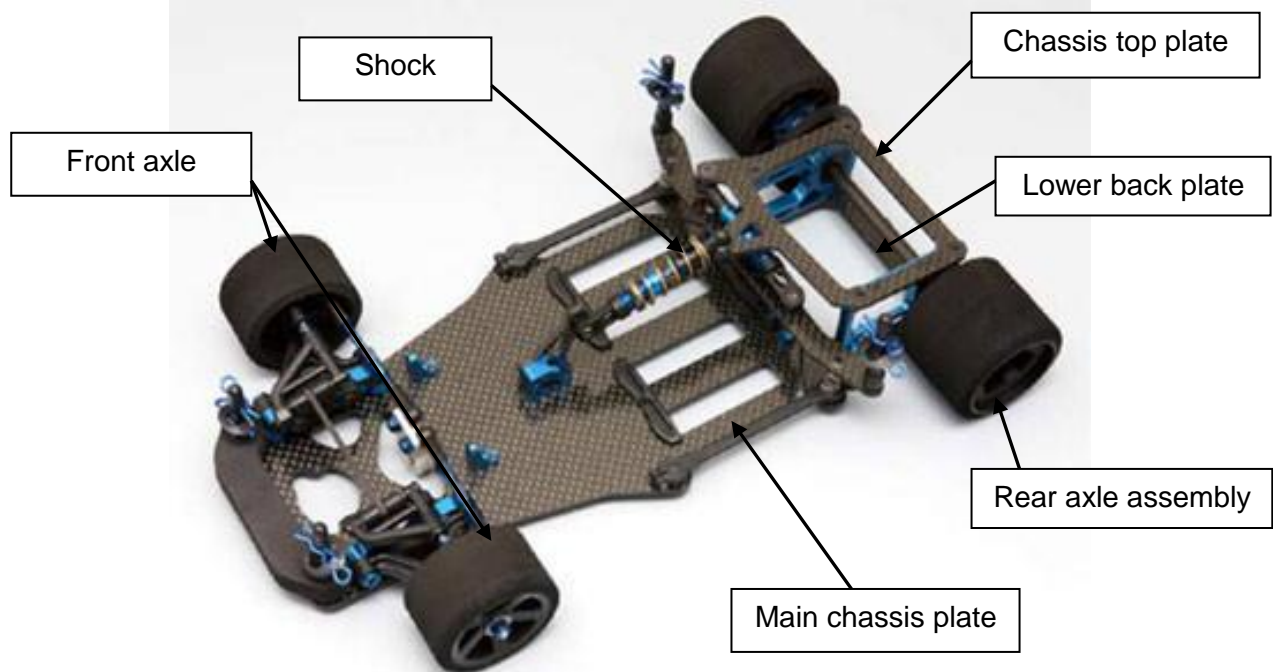


Fig. 2. Electric 2wd chassis main components

For off-road chassis a different approach is used as the necessity of operating in a different environment requires more

suspension travel. In order to transmit motion to the wheels a CVD (constant velocity driveshaft) system is used as in Fig. 3.



Fig. 3. CVD Transmission used in off-road chassis

A typical approach for two wheel drive off-road chassis is found in Fig. 4. The figure represents an Team Associated B4.1 2wd

chassis the current world champion title holder in 2011. As you can see the configuration is very similar to the on road

chassis the main difference is the introduction of CVD transmission and bigger shock absorbers as seen in next photo. Fig.5 . a

typical rear two wheel drive gearbox can be seen.

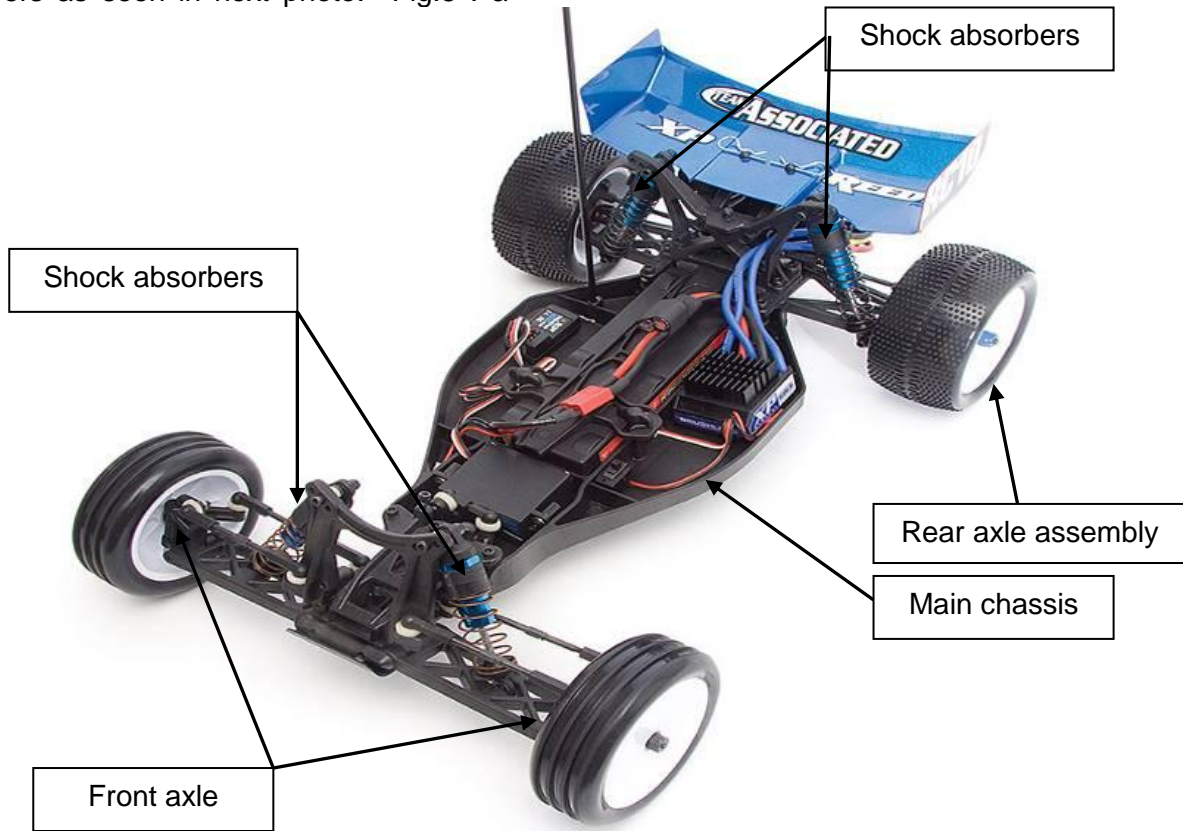


Fig. 4. 2WD off-road chassis main components

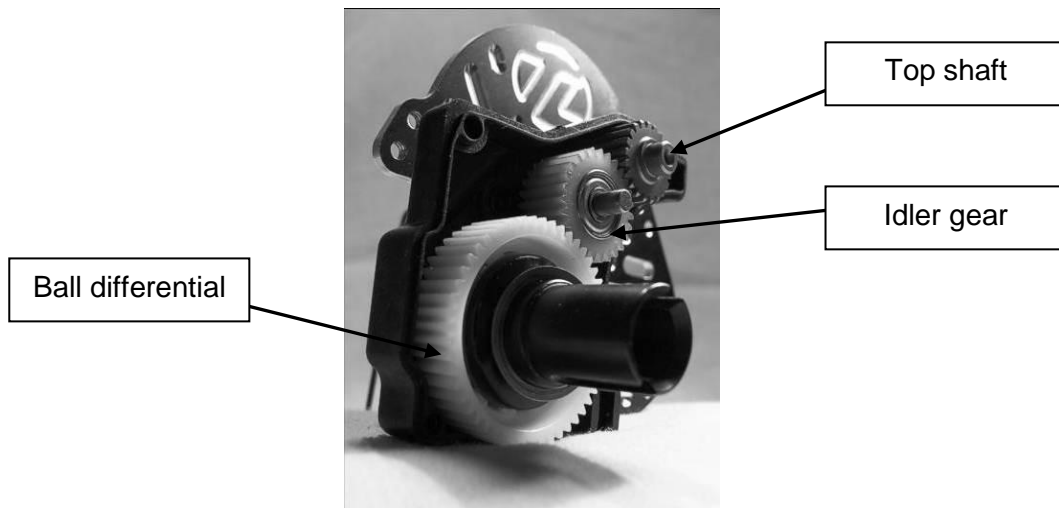


Fig. 5. CVD Typical rear drive off road transmission used in remote cars.

In four wheel drive chassis design things are more complicated. The free space is reduced by using shaft or belts to drive the front wheels. On on road chassis belt drive is preferred because of the smooth drive and

control needed for high speed operations. In off road the shaft is the main type of transmission used because it is robust and high torque can be transmitted to the wheels. A typical example can be seen in Fig.6.

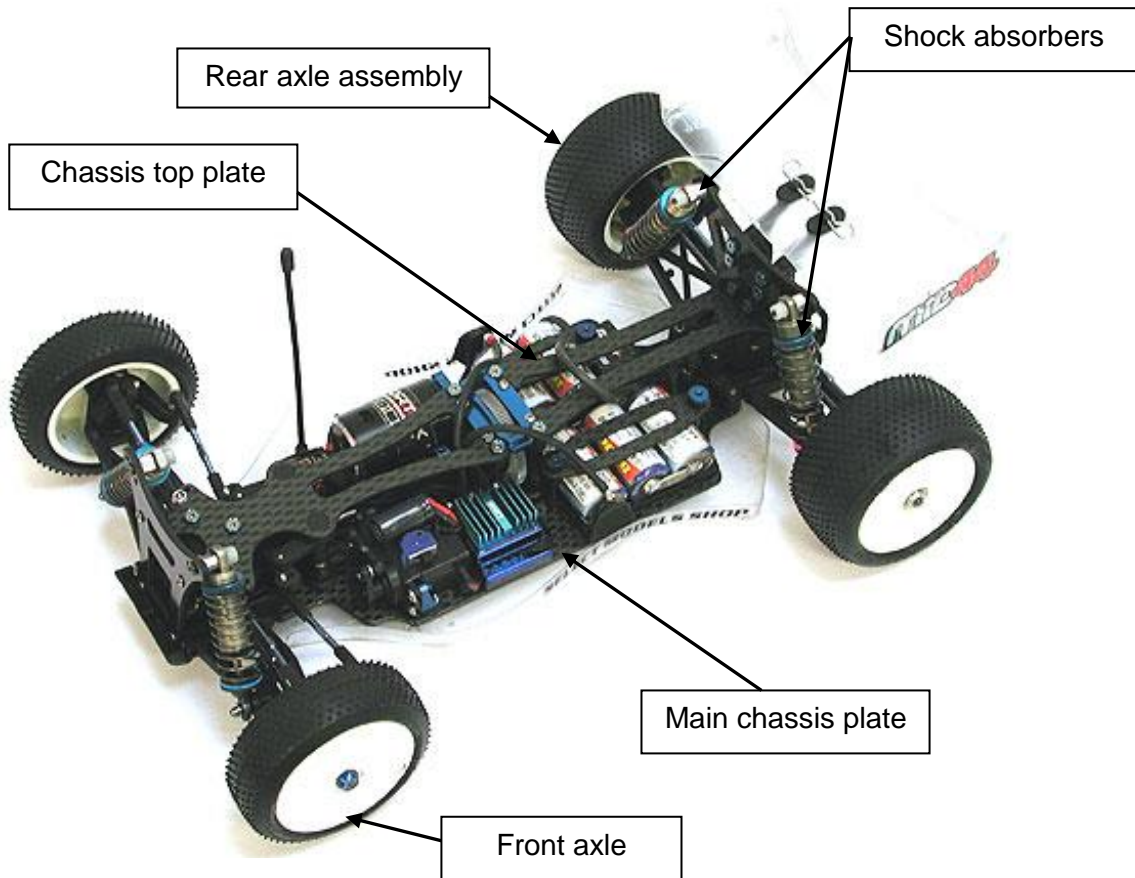


Fig. 6. Electric 4wd chassis main components



Fig. 7. Electric 4wd chassis CVD drive used rear and front.

2. USE OF COMPOSITE MATERIALS

As new technologies in electronics, new brushless motors, controllers and batteries are discovered the need for composite materials is increasing. Two main directions are followed, increased strength and lighter materials. Inspired by real vehicles and price drops in carbon reinforced materials, composite plastic or even titanium the remote control industry increased the usage of composite materials in current racing chassis models. There are many areas where

composite materials are used: chassis plates, shock towers, links, gears, gearboxes or even body shells. One of the most commonly used material is carbon fiber reinforced polymer. The main goal is increased rigidity with minimal weight gain. In Fig. 8. is illustrated a common four wheel drive off road racing chassis made from carbon fiber reinforced polymer or woven carbon graphite. Some may say why we need such materials for a small scale vehicle. The new motor generation can deliver an impressive 730W

with 11.900KV. This means with a simple 7.4 volts Li-Po pack we could reach in excess of 88000 rpm or even higher. The chassis flex at this rpm values is very high a plastic chassis would not resist the massive forces

involved. Also with this vehicles capable of high speed a landing after a jump could be fatal for the chassis structure. Even with the use of such materials accidents may occur.

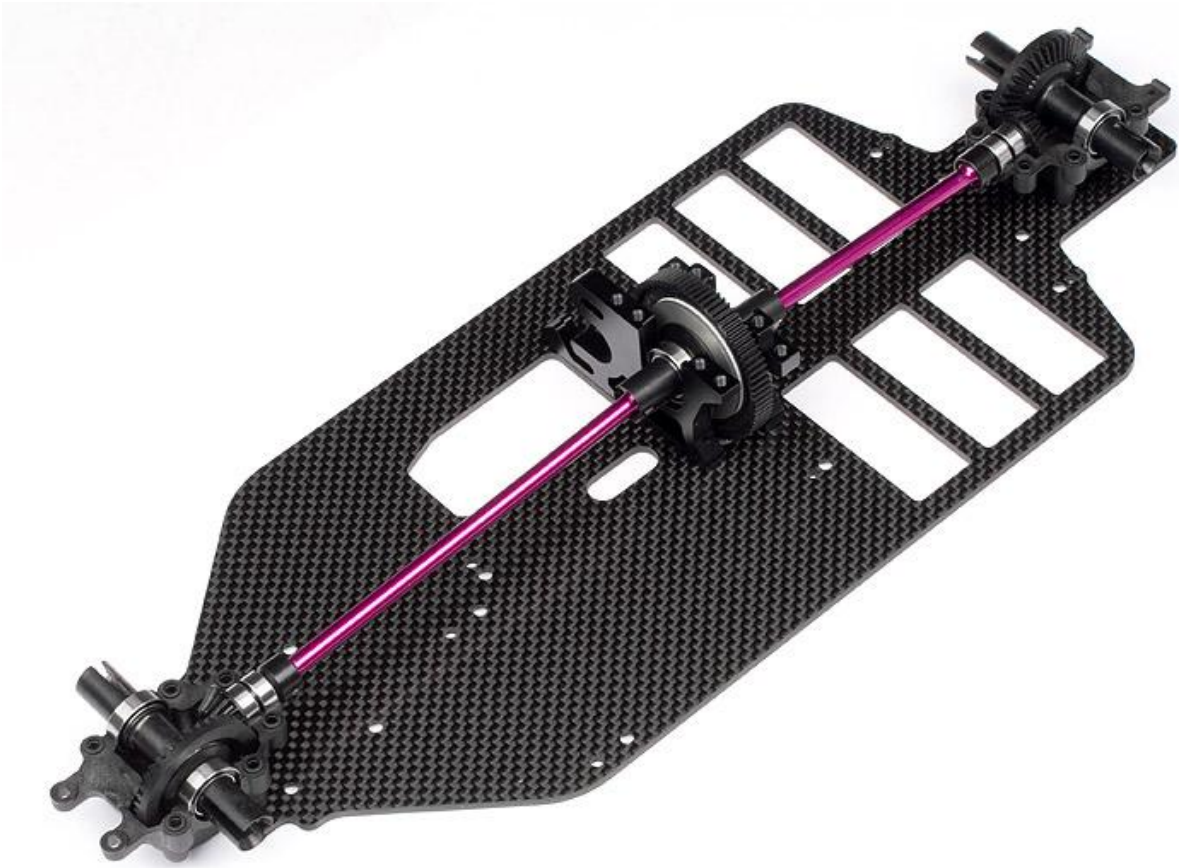


Fig. 8. Electric 4wd carbon fiber reinforced polymer chassis



Fig. 9. Kevlar reinforced drive belts

Another use of composite materials is for drive belts. Belts are used especially in on road remote controlled vehicles because they can provide a smooth and precise motion transmission. As seen before the impressive rpm range and power generated by the motors, has forced the manufactures to add materials like Kevlar in order to strengthen the belts. Reinforced drive belts used on remote controlled cars can be seen in Fig. 9. As new technologies emerge every year the need for stronger and lighter materials is increasing as well as the number of racers that enter this interesting field. There is always place for further developments in materials and designs to be used.

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