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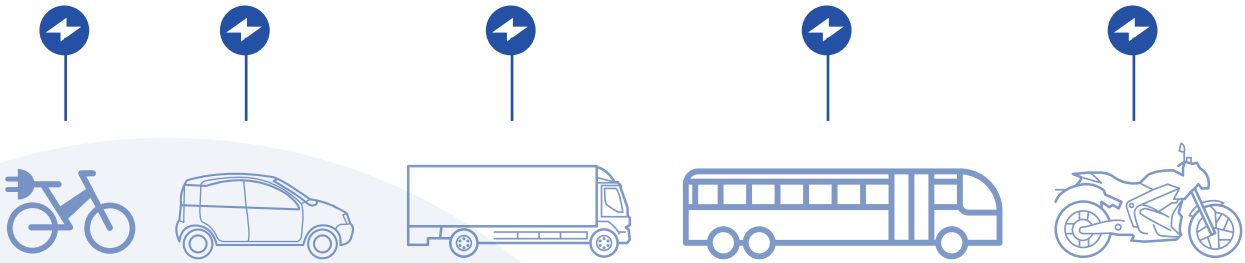


Precision Machining Business Opportunities in eMobility

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eMobility
Electromobility

At its core, **eMobility** - also commonly referred to as **electromobility** - is a term that describes the use of **electric cars, bikes, busses and similar vehicles** as we go about our daily lives.



Rather than using a fuel source like gasoline, these options draw energy from the **power grid** and store it on board via a **battery system.** In addition to being very quiet, they're also incredibly efficient - all while acting as a low-emission alternative to traditional cars at the same time.



Electric vehicles (EVs)

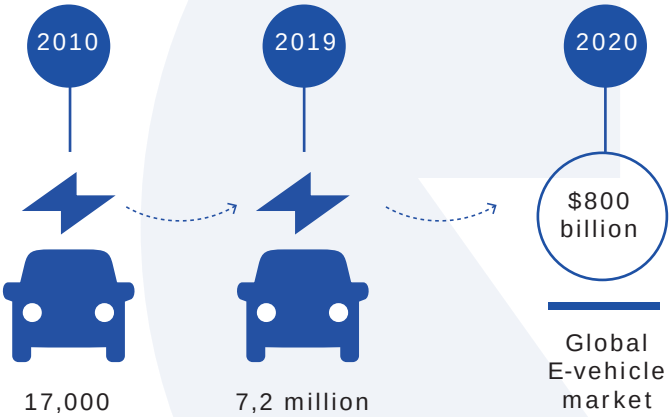


Autonomous vehicles (AVs)

Two of the main types of vehicles that fall into this category are electric vehicles (EVs) and autonomous vehicles (AVs). EVs, as the name suggests, get either a significant portion of or all of their power from the electrical grid. AVs are something a bit different - here, you're talking about cars and trucks that can essentially operate without human involvement. They can sense the characteristics of their surroundings and make adjustments accordingly - thus allowing them to act as "self-driving vehicles" in every sense of the term.

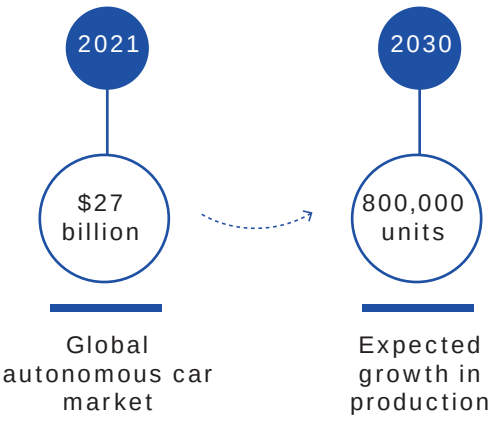
Even before the ongoing COVID-19 pandemic, electric vehicles in particular were gaining significant popularity. Thanks in large part to notable organizations like Tesla, the global electric vehicle market hit an **enormous $800 billion in 2020.** Another recent study revealed that in 2010**,** there were approximately 17,000 electric cars on roads across the world. Flash forward just a few years to 2019, and that **number had climbed to an incredible 7.2 million.**

Number of electric cars on roads across the world!

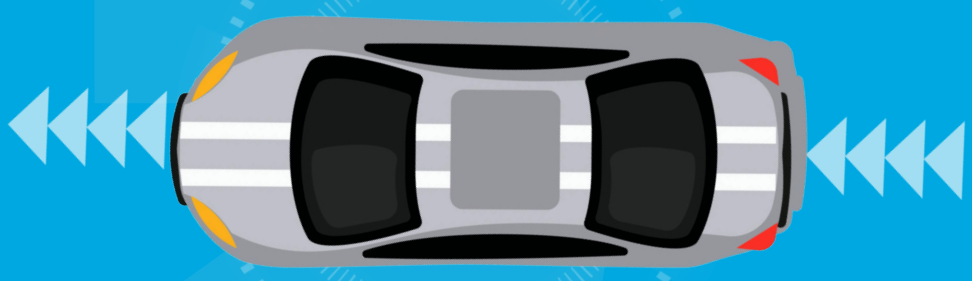


Similar trends are playing out in terms of the autonomous vehicle market, albeit at a slightly slower pace. **Another recent study** indicated that the global size of the autonomous car market had hit $27 billion in 2021. Much of this has to do with the **fact that about 55% of small businesses** in particular believe that their fleets will be fully comprised of AVs at some point within the next 20 years. All told, the annual production levels of autonomous vehicles is anticipated to reach **800,000 units globally by as soon as 2030** - pointing to one trend that shows absolutely no signs of slowing down anytime soon.

Global size of the autonomous car data



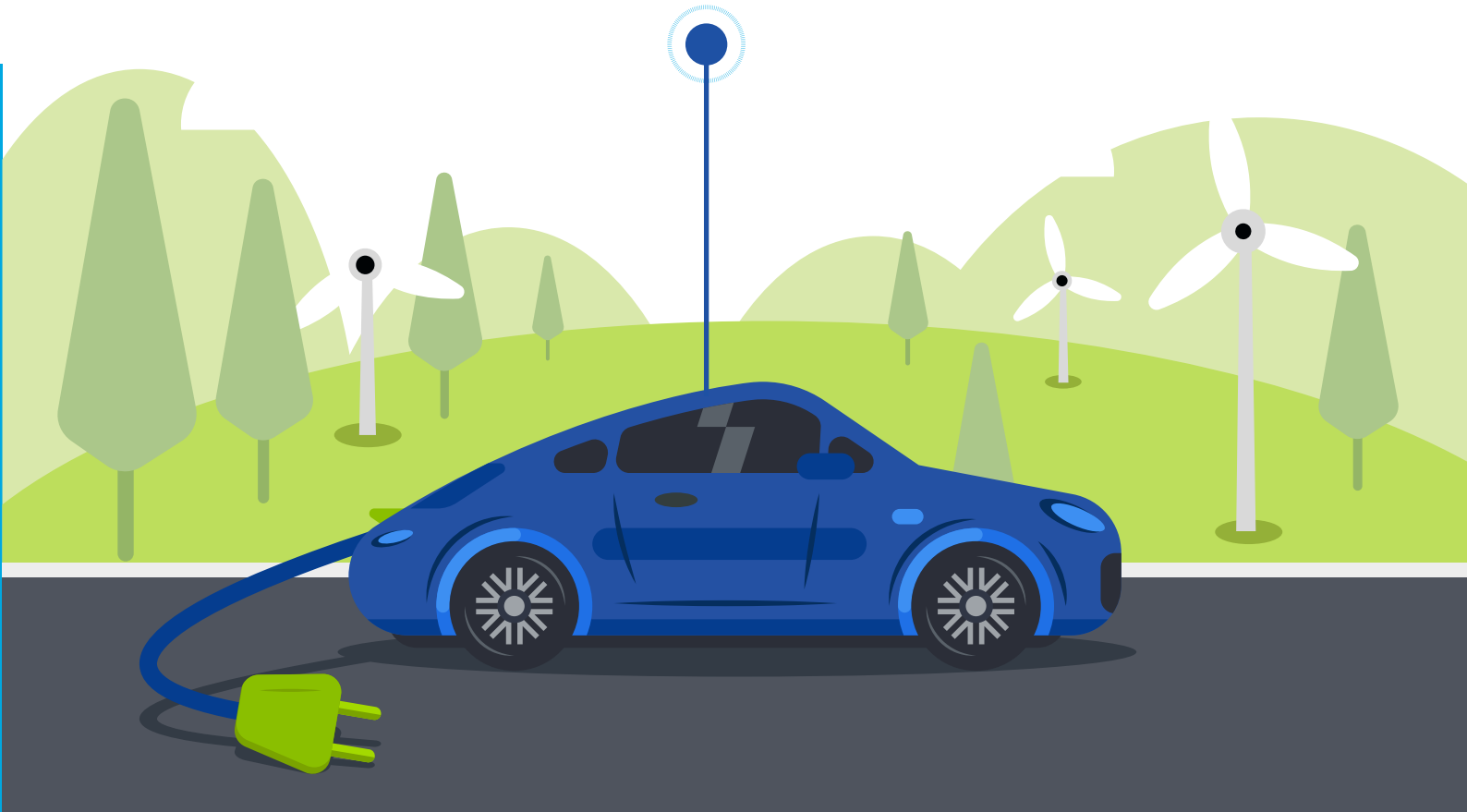
Although the actual characteristics of AVs and EVs will vary wildly depending on their manufacturer, their country of origin and their intended purpose, they all share one thing in common: they require precision machining parts to achieve success.



Precision Machining Parts for eMobility: Breaking Things Down

Requirement of precision machining parts for eMobility

1. Battery Production
2. Ultra Clean Materials
3. Advanced Coatings
4. Tighter Fits & Closer Tolerances



Battery Production

With regards to EV precision machining requirements in particular, one of the most important components is obviously the battery. Battery production is nothing if not incredibly precise, and the stakes of getting it wrong are particularly high. The types of battery cell structure and their interconnection mechanisms commonly found in electric vehicles can only be created with advanced CNC machining capabilities. Power-train manufacturing, body panels and similar components are also top priorities.

Of course, this process is not without its fair share of challenges. Organizations need to be able to meet not only an exceptionally high volume, but a high quality as well. Consider the fact that, by most estimates, **roughly 50% of all cars on the road** will be fully electric by as soon as 2040. It's going to require an enormous undertaking to build the type of infrastructure needed to hit those numbers and avoid significant bottlenecks, which in turn could wind up harming adoption.

Ultra Clean Materials

Another major requirement in terms of precision machined parts for eMobility comes by way of how they require ultra clean materials by their very nature. Steels of high purity (cleanliness) are needed because they have high fatigue strength, high power density and go a long way towards contributing to weight reduction.

If a particular material has good hardenability, it also has good dimensional quality predictability as well - which is ideal for a situation where you suddenly need to mass produce electric vehicles as quickly as possible. This does create a situation where if the machinability of these materials isn't where it needs to be, the cutting time required will be longer. Ideally, the part design will require less material to be removed - thus helping to get these parts into the hands of manufacturers and the vehicles on the road as quickly as possible.

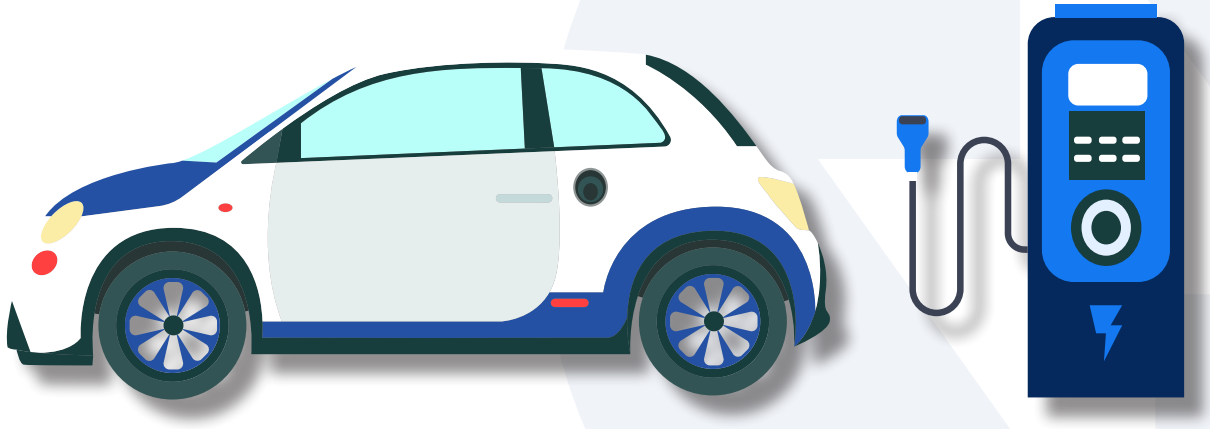
Advanced Coatings

Another common characteristic that precision machining parts for eMobility share is that advanced coatings are almost always required. When you're talking about a traditional, gasoline-fueled vehicle, the job of these coatings involves protecting components in and around the car from things like corrosion, abrasion and similar issues. In terms of EVs and AVs, more advanced coatings will be required to keep the car as cool as possible and to help reduce the amount of energy required for core functions like climate control, for example. They'll also be essential in terms of taking care of heat management around sensitive components like the car's battery or electric motor.

They'll also have to continue to contribute to the color and overall appearance of the car - creating a demanding situation if there ever was one.

Tighter Fits & Closer Tolerances

Finally, one major requirement of precision machining parts for eMobility has to do with the fact that tighter fits - and closer tolerances - are a necessity. Keep in mind that an electric vehicle does not have the loud noise of an internal combustion engine to fall back on. Most people would be surprised by how much noise their cars make in normal operation - it's just that they can't hear it over the natural hum of the engine. Without that internal combustion engine, virtually any noise is very easy to detect - which could ultimately harm the quality of the experience manufacturers can offer to their end users.





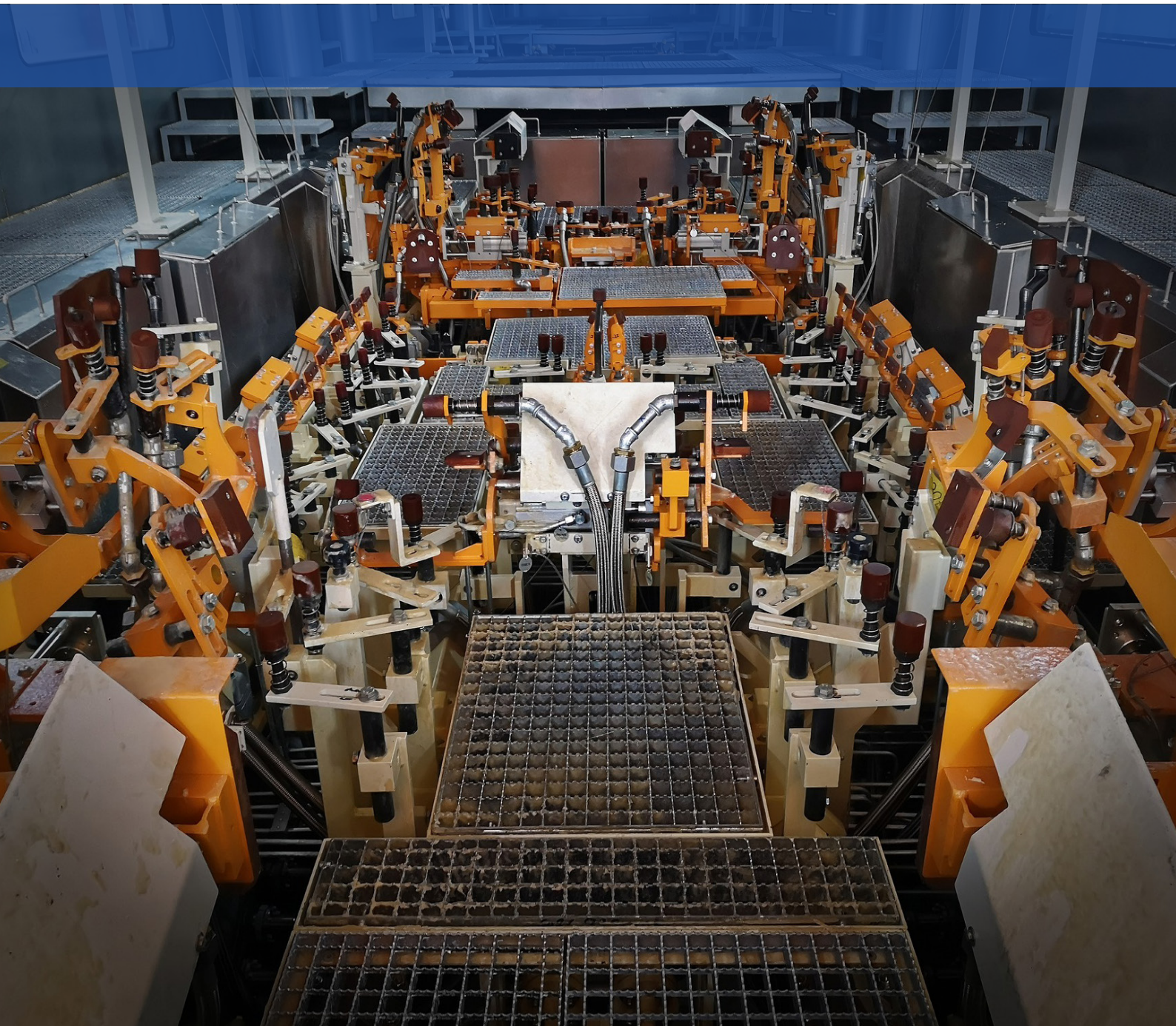
The Challenges of the eMobility Manufacturing Process

As stated, all of this brings with it its fair share of challenges - but as the old saying goes, *“necessity is the mother of invention.”*

Machining these types of materials will naturally make the manufacturing time take longer and will cause the pace to go slower. In an effort to counteract this, solid carbide cutting tools will be required. Likewise, blank preparation becomes more important than ever. Blanks remove the need to square up the material you’re working with prior to finishing the part, which also goes a long way towards eliminating the need for specialized machines that could slow down the process even further. Blank preparation has long been seen as a way to increase the overall capacity of a machine shop without necessarily increasing the overhead costs - both of which will be essential as EVs and AVs become more popular and widely available as time goes on.

Another major challenge for the manufacturing process in terms of eMobility has to do with the fact that real-time quality tracking and monitoring will become critically important. Likewise, any process adopted must be A) robust and have B) solid repeatability, all in the name of getting these parts into the hands of the people who need them as quickly as possible.

Yes, all of this will create significant hurdles for most precision machining organizations to overcome. But those that innovate and solve these challenges will be able to make a significant name for themselves as the eMobility market continues to grow over the next decade and beyond.



The Common Materials for eMobility Parts

One of the most commonly used types of materials for eMobility parts is aluminum. It's notable because the required cutting force is actually quite low, coming in at only about 50% of steel. This is something that allows organizations to machine those crucial parts faster, thus avoiding bottlenecks in the process. It also has a thermal linear expansion that is twice that of steel, which further helps with heat management and related concerns.

Composite materials are also popular in terms of eMobility parts because they bring with them benefits like durability and a superior resistance to damage from the weather and harsh chemicals. Unfortunately, they're not the easiest type of material to work with. They require the right type of equipment, exactly the right tool and a rock-solid ventilation and dust collection system. All of this is necessary to not only make sure that parts get machined properly, but to protect workers from significant health and safety hazards as well.

These types of materials are used in a wide array of different eMobility parts - from gears and shafts to battery cell structural parts and much, much more.

The Future of eMobility Begins with Precision Machining

In the end, one of the most important things to understand about the precision machining business opportunities in eMobility is that they literally exist all over the globe. Currently, **China is the largest market in the world** with approximately 2.3 million units. Europe currently comes in second, with 1.2 million units. The United States isn't far behind, with 1.1 million units.

eMobility world market



2.3 million units | 1.2 million units | 1.1 Million units

Even in terms of fully autonomous and self-driving vehicles, the future is predicted to be a strong one. Right now, **there are over 1,400 self-driving cars** operating on roads in the United States - a number that is increasing literally every day. Over 80 companies have begun testing models of their own. Since becoming one of the first states to test autonomous vehicles on public roads, more than 60 companies have registered for future production in California alone.

Autonomous vehicles in USA

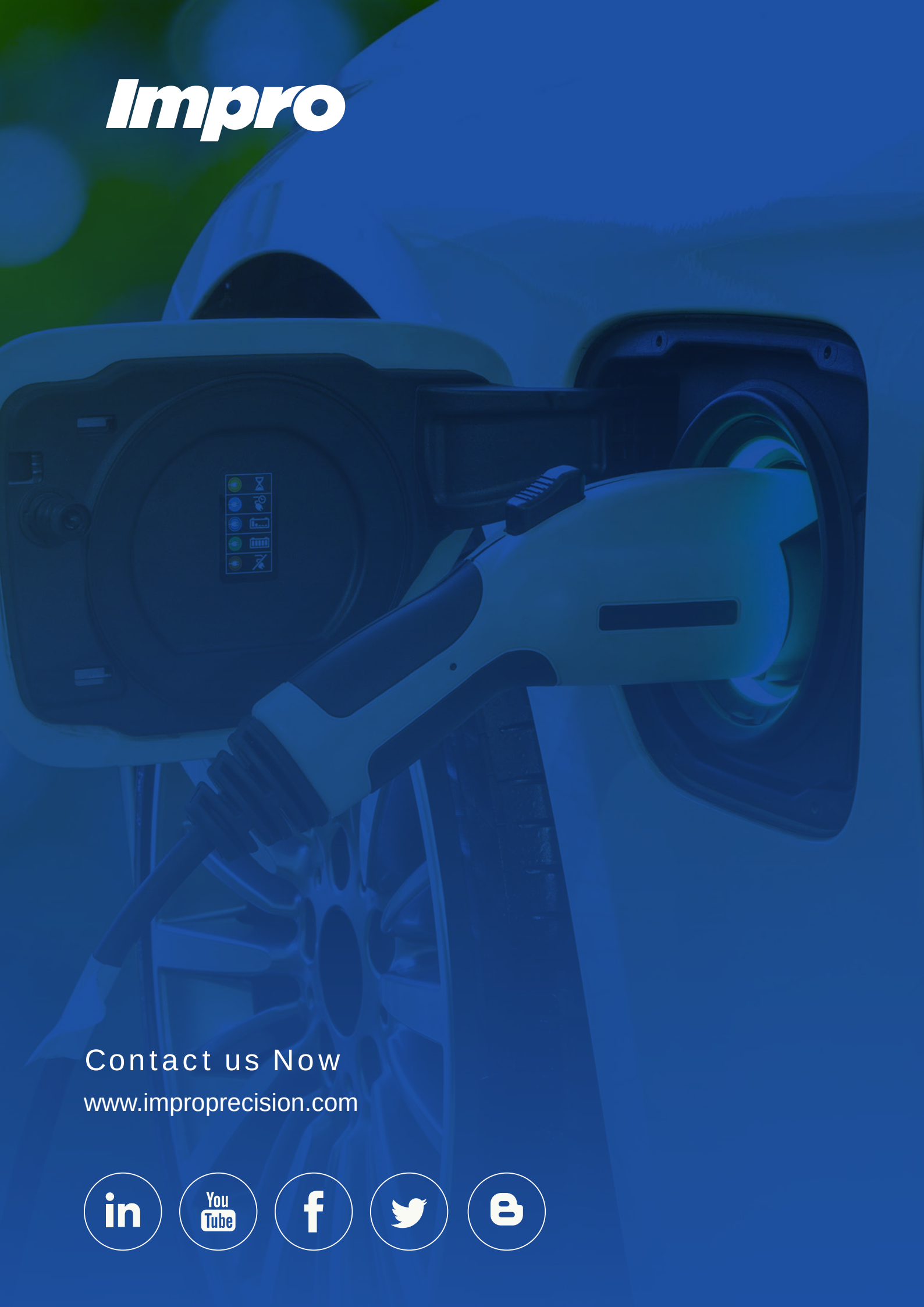


Currently operating in the USA | Currently testing models | Registred for future production

Yes, the auto manufacturing industry in the United States is about to change in a big way - and that will absolutely impact the world of precision machining, too. But that doesn't have to be the liability that certain people seem to view it as - it can and should be seen as an opportunity just waiting to be taken advantage of by those savvy organizations that have been paying attention all along.

Those precision machining organizations who understand this - and who can clearly see where things are headed - need to start getting ready for this inevitable future today. At that point, they'll be able to lay the rock-solid foundation they need to guarantee the next decade of their success and beyond. Those who don't will soon find themselves left behind by their savvier competitors - truly, it doesn't get much more straightforward than that.





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