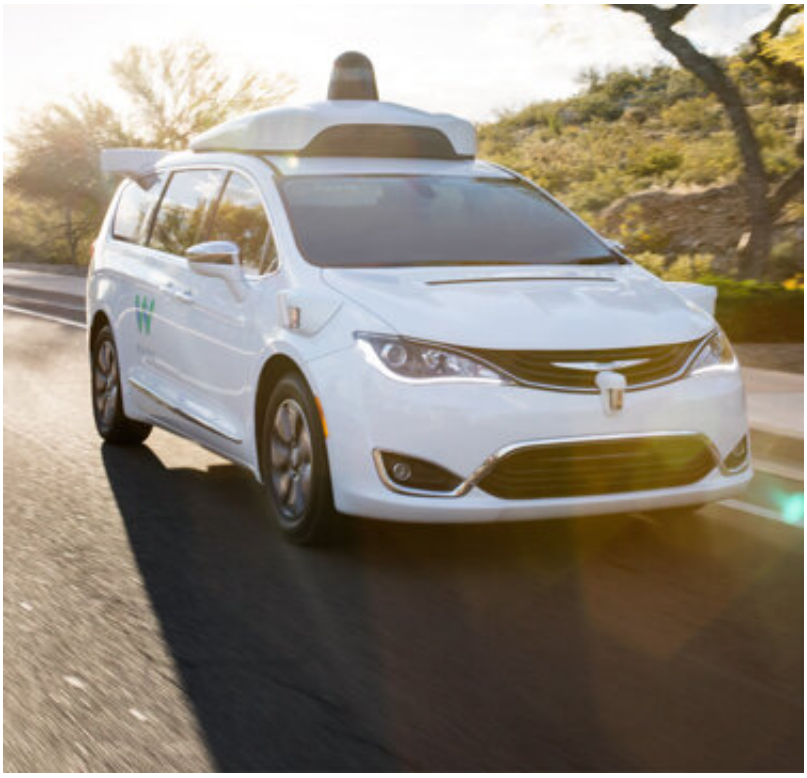
Waymo's Bay Area depot is a glimpse of autonomous vehicle future

February 23 2022, by Ryan Fisher and Andrew Grant



Credit: Waymo

They say seeing is believing. On a brisk and sunny February morning, a ride around San Francisco in a Waymo fully autonomous vehicle and a walk around the company's depot was indeed eye-opening.

I'm Ryan Fisher, and along with my colleague Andrew Grant, we saw a

trip to the West Coast for BloombergNEF's San Francisco summit as a chance for some on-the-ground research. Once our work at the conference was complete, we headed to the Bayview district to see Waymo's operation in action.

The autonomous-driving company spun-off by Google parent Alphabet operates a pilot ride-hailing service in the city, with a few hundred autonomous vehicles. So one of the first things you notice upon arrival at the depot is the cars buzzing around, including Jaguar I-Pace electric vehicles and Chrysler Pacifica plug-in hybrids. All are fully kitted-out with an array of sensors, including a 360-degree lidar system.

First, we hopped into one of the vehicles for a ride. The 15-minute journey was unremarkable and the experience was not dissimilar from calling for and riding in an Uber. Some details did jump out at us as a sign of just how much car companies and dealerships especially will be impacted by the rise of AVs. It struck us as symbolic that the Jaguar leaper badge on the electric I-Pace is covered by an array of cameras with the Waymo logo, highlighting the tension between the two brands as automakers try not to be eaten by a bigger system integrator and simply become a manufacturer of hardware on wheels.

The I-Pace is a stylish vehicle designed to be driven but it is not an optimal vehicle for a robo-taxi service (Waymo and Jaguar announced their long-term strategic partnership back in 2018). The fit in the back seat alongside my colleague and the Waymo representative was snug. The dimensions of AVs are likely to be redesigned in the future to fit the purpose of the vehicle. Ride-hailing leaders Didi and Uber have enlisted the help of established automakers in doing so. Without a driver and potentially a steering wheel, there's more space to work with. A center console in the I-Pace offers the opportunity to play your own music—it's easy to imagine it as a console for video content or shopping and gaming appearing on bigger and better positioned screens.

The journey got us thinking about the feasibility of AV ownership models and which would be best for automakers. The Tesla thesis is that its Full Self-Driving capable vehicles will one day be upgraded to fully fledged robo-taxis and individual owners will be able to offer rides to users over a ride-hailing platform. Robo-taxi developers like Waymo and its General Motors-backed rival Cruise are operating on a centralized vehicle ownership model. Cruise, for example, has signed an agreement with Dubai's Roads and Transport Authority to be the exclusive provider for self-driving taxis and ride-hailing services through 2029.

Each of these approaches presents challenges. Can Tesla safely bring the technology to market while using ordinary drivers for testing and will it be possible to make the technology cheap enough for personal ownership? Especially when the industry is converging around expensive lidar technology over the camera-only vision system which Tesla currently uses. For ventures like Waymo that are attempting a centralized vehicle ownership model, can the company continue to keep up with the high capital requirements while at the same time solving the intricacies of computer vision algorithms and the less-discussed but highly challenging details of operating a ride-hailing service?

Despite the significant progress in mapping cities, deploying fleets for consumer trials and winning the approval of local regulators, AVs will continue to achieve progress mostly through trial and error. It takes lots of work and capital to deploy successfully in any single city or district and slowly expanding the geo-fenced areas of operations. This is a major reason why BloombergNEF's long-term outlook for road transport shows fully autonomous vehicles taking until 2035 to surpass 1% of all car sales.

After 2035, sales are expected to quickly grow to over 10% of all car sales by 2040. Due to the extensive usage of the vehicles, AVs will account for over 15% of total electricity demand of the passenger

electric vehicle fleet. This rapid growth in electricity demand will have implications for the charging infrastructure sector.

The Waymo depot in San Francisco has one of the largest charging installations in the city, with 19 DC charging stations offering over 2 megawatts of total load, enough to power 1,000 to 2,000 homes. Upon inspection, the cars are charging at only 30kW, most likely as a way to limit battery degradation. In 15 years, we don't see the depots looking quite like this one. To reduce labor costs the chargers will either have robotic arms to plug in the cables or wireless charging pads embedded in the ground. The latter is something Jaguar is already testing, working with Momentum Dynamics and ordinary taxis in Oslo.

To reduce infrastructure costs AVs will likely utilize a specific network of depot and community charging stations. A shared charger is a cheap charger. A strategically placed distributed network can also reduce the size of the battery since vehicles will be able to top up throughout the day.

The change in charging requirements for the rapidly growing global AV fleet in the mid-2030s from the ordinary passenger electric fleet also points to the threat of redundancy to other charging infrastructure in the network that may have been installed only a few years earlier. This highlights the importance of sites, particularly those being installed in cities around the 2030s, needing to be suitable for AVs and the chargers having the ability to be retrofitted to meet the vehicles' specific charging needs.

There's been a lot of talk in recent years about the slow adoption of AVs, but the impression, after the visit to the Waymo depot, is that real progress is being made. The path to large-scale adoption remains unclear, but with more companies opening their autonomous vehicle programs to the public, perhaps you will also experience a ride soon.