Engineering Reality Magazine recently interviewed Chris Kinser from General Motors, the Director of their Global Autonomous Driving Center in Michigan and an industry expert in rapidly emerging sector of vehicles (AVs). He has a long history of working on electrification and autonomous driving systems, and his team in Milford is responsible for vehicle integration of several General Motors’ advanced technology programs, including self-driving vehicles, as well as automated driving and active safety technologies. Chris’s expertise in software, controls systems and vehicle performance integration have been recognized with three Boss Kettering Awards. Chris holds a Bachelor’s in Electrical Engineering from Kettering University and a Master’s of Engineering from Rensselaer Polytechnic Institute, USA.
What does your role in General Motors involve and what is GM’s overall approach to the fast-emerging Self-Driving opportunity?

I am the Director of the Global Autonomous Driving Center at our Milford, Michigan proving ground where I manage a large engineering team. We believe that autonomous technology will play a key role in our vision of a world of zero crashes, zero emissions and zero congestion through the enormous potential benefits it holds for society in the form of increased safety and access to transportation.

General Motors is in a unique leadership position when it comes to developing and deploying self-driving vehicles in that we are the only company to have everything from design, engineering, validation, and testing all under one roof. My team is works closely with teams all around the country on developing autonomous driving solutions.

What do you see as the big challenges to Autonomous Mobility going mainstream in the next 10 years?

We are in the middle of a fundamental shift in how people and goods move through the world. Autonomous mobility will certainly play a huge part in that and at GM, we will be guided by the needs of our customers. It is also one of the most difficult challenges for automotive engineering. The biggest challenge I see to Autonomous Mobility going mainstream is getting all the systems necessary for self-driving vehicles to work together seamlessly. Next time you’re behind the wheel, take a moment to reflect on all the tasks you are performing to drive the vehicle. Working on developing a system that can perform those same tasks is the engineering challenge of our lifetime. That’s why at GM, we believe that a safe self-driving vehicle should be built from the ground up with seamless integration of the self-driving system.

Why did GM choose Hexagon/MSC technology for its Autonomous Driving strategy?

We see Hexagon as a company totally devoted to the autonomous sector in its business focus. Hexagon’s combination of sensor and scanning technologies like Leica cameras, and its simulation software suite like MSC’s VTD (Virtual Test Drive) software, fill many of the needs of the market. VTD is in the center of a comprehensive GM simulation environment that we have developed with Hardware-in-the-Loop. We use VTD in conjunction with software products like CarSim and Simulink (for control systems) in our real time virtual automated driving vehicle testing environment.

What is your vision for GM in the autonomous mobility space in say 5 years from now?

It is still the early days of autonomous mobility and we are excited by the opportunities for this technology to improve the world. In terms of engineering and development, we will continue to listen to our customers and deliver advanced mobility solutions that meet their needs.

Which country or countries do you think will go fully autonomous with cars first in your opinion?

I can’t speak to the specifics of timing, but we have focused our shared autonomous development on San Francisco and the United States.

Will all autonomous cars be electric vehicles?

At GM, we believe that all autonomous vehicles will be electric vehicles. Not only are electric vehicles better for the environment and quieter for city traffic, but they allow for simpler integration of the advanced technologies required for the cleanest and safest operation of autonomous vehicles. For example, an all-electric vehicle has a more stable power source and a faster responding propulsion system that provide it inherent advantages over its internal combustion counterparts.
General Motors operates a total vehicle performance center at the Milford Proving Ground in Michigan (Figure 2). The Global Autonomous Driving Center is a subset of this work focused on developing active safety features like advance park assist, lane keep assist, full-speed range adaptive cruise, and Super Cruise. This work is guided by GM's vision of a future with zero crashes, zero emissions, and zero congestion. The mission of our team is to provide smooth, capable driver assist systems that delight our customers.

GM's Approach to Automated Driving

The industry standard scale for levels of autonomy (SAE) is helpful from an academic perspective when discussing vehicles and their capabilities. However, when we begin development of a new vehicle or system, we don’t start with a level in mind, but rather with the use case and a set of features that we believe we can safely implement. It is this focus on safety that guides us through the process.

General Motors is the only company that has everything from design, engineering validation, and testing all under one roof. This is more than just designing and building the vehicle. It also includes everything from in-house security and connectivity systems to software development and high-resolution mapping. Having everything under one roof puts us in a unique position to safely develop and deploy autonomous vehicle technology.

Super Cruise

Super Cruise is an advanced driver assistance feature that enables hands-free driving on supported roads. It combines adaptive cruise control and lane-centering control with a driver attention system (Figure 3) to allow you to drive with your hands off the wheel and eyes on the road. Super Cruise is aimed at providing comfort and convenience in long-distance travel and daily commutes. Customers receive updated maps on a regular basis (Figure 4).
Safety is engineered into every step in Cruise’s self-driving vehicles including design, development, manufacturing, testing and validation.

Cruise Autonomous Vehicle (AV) Program

In May 2016, GM completed the acquisition of Cruise Automation, a Silicon Valley startup with considerable self-driving software development expertise. Combined with our expertise in engineering and developing vehicles, our teams began testing self-driving vehicles in San Francisco, CA, Scottsdale, AZ and Warren, MI. By September 2017, we revealed our first self-driving test vehicle built from the start to operate on their own with no driver (1). Safety is engineered into every step in Cruise’s self-driving vehicles including design, development, manufacturing, testing and validation.

On a typical day, Cruise autonomous test vehicles safely execute 1,400 left turns and our teams analyze all that data and apply learnings. Based on Cruise’s experience of testing self-driving vehicles, every minute of testing in San Francisco is about as valuable as an hour of testing in the suburbs because of the complex decisions being made.

Reference

‘How we built the first real self-driving car (really)’, Kyle Vogt, Cruise, September 11, 2017 Blog Post: https://medium.com/cruise/how-we-built-the-first-real-self-driving-car-really-bd17bd0d956c

Figure 3: General Motor’s Super Cruise Cadillac Driver Attention System

Figure 4: GM Super Cruise, before going to production, required mapping every major road in the U.S. and Canada