A look at Mazda's

SKYACTIV-VEHICLE ARCHTECTURE

by Benjamin Yong **photos by** Benjamin Yong

If you have driven a Mazda made within the last five years, then you have experienced SKYACTIV, a suite of technologies designed to lower fuel economy and emissions as well as increase drivability and safety.

What some may not know is that this technology applies not only to the engine bay but also everywhere else, including the body and chassis, the latter dubbed SKYACTIV-VEHICLE ARCHITECTURE.

The automaker recently showcased the next generation version—centered on minimizing occupant discomfort—that is still in the works at their North American Research and Development Centre in Irvine, California. We caught up with Dave Coleman, Mazda North America vehicle development engineer, to explain what is special about the upcoming platform.

Collision Quarterly: *How would you describe the new vehicle architecture in a nutshell?*

Coleman: We've prioritized our efforts in getting the car to travel in a more natural and human way, making sure it follows the same sort of smooth motions that our bodies normally move in. The focus is on how the vehicle motion transfers to the driver very directly, without any delay or vibration.

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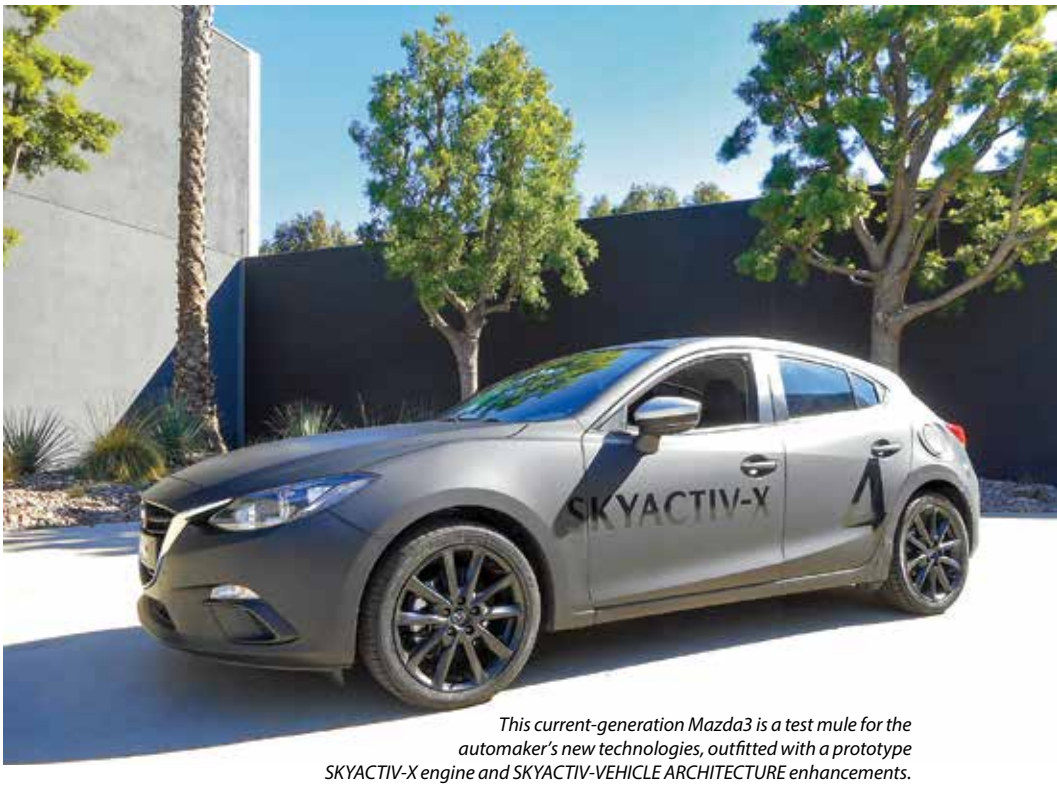
So, for the body structure itself, the goal is to really improve on the diagonal stiffness, which has a lot of impact on how directly inputs get transferred to the driver and how quickly loads get transferred from the corner of the car, the suspension input point, to the seat.



This current-generation Mazda3 is a test mule for the automaker's new technologies, outfitted with a prototype SKYACTIV-X engine and SKYACTIV-VEHICLE ARCHITECTURE enhancements.

We've tried to juggle around the stiffness of the various parts of the suspension. If you look at how the car moves over an imperfection on the road, the load has to go through the tire, through the bushings, through the spring and damper into the body structure and into the seat before it gets to the driver. We're working on tuning those parts together so everything works in harmony to produce a desirable kind of motion.

CQ: *So all the changes work cohesively?*

Coleman: Let me give you an example. When a driver goes over a speed bump, they would feel first a little bit of deceleration as the tire hits the bump, and then a fraction of a second later they'd feel the car moving up as it finally goes over. Those two inputs come separated a little bit and that's something people aren't really tuned to deal with. As we start balancing ourselves against one input, suddenly another one comes from another direction, throwing you off balance a little bit.

We've switched to a softer tire to help smooth out the initial contact, and stiffened the bushings to help keep the control arm stable, forcing the tires to keep rolling over the bump, resulting in clean acceleration without the gap I mentioned earlier. I know it doesn't sound like any of this matters

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<laughs>. We're talking about a tiny force separated by tiny fractions of time, however when you drive, actually drive the vehicle, it feels solid and composed.

In terms of the seats, there are these new damping nodes to cancel out any higher frequency vibrations that might transmit to occupants. They're just stiffener plates made out of a rubbery material installed right underneath where the seat mounts are to absorb energy. It's kind of like if you make noise by tapping on a piece of metal and then you place your soft, cushy hand overtop, suddenly the ringing stops. In addition, we've added another mechanism to the backrest adjuster so it locks up tighter than before, and the seat sliders are less prone to bending. The cushioning has double the amount of damping compared to the old foam so you don't bounce out of the seat.

Journalists got a chance to check out Mazda's upcoming innovations during a short drive in a Mazda3 test car outfitted with the SKYACTIV-VEHICLE ARCHITECTURE and SKYACTIV-X powertrain.

Side view of the new Mazda SKYACTIV-VEHICLE ARCHITECTURE body structure.

CQ: *Can you elaborate on the structural modifications?*

Coleman: The main structural purpose of the car of course is to control crash energy, the biggest force it's ever going to have to deal with, which is why the majority of the structure is designed for this purpose. The load paths that come in from the bumpers transfer load around the passenger compartment without deflecting the compartment at all. The areas we've made changes to connects some of these crash structures for the purpose of speeding up the diagonal response across the chassis so when we hit a bump, the car reacts more naturally.

There was a spot at the front of the rear wheel well, for instance, where there wasn't really any structural need from a crash standpoint to have a particular reinforcement there, but it turns out if we did just close that loop on the section that goes around the doors, it sped up the load transfer across the car after hitting a bump. So it's a couple places like that and between the rear suspension and the hatch, strangely enough, places where you wouldn't necessarily think it would matter it also helped. So it's simply trying to use the existing crash structure as much as possible and then add stiffness where we need it to improve response.

Along with the revised vehicle platform, Mazda is also coming out with a new, 30 per cent more efficient compression-ignition engine design dubbed SKYACTIV-X.

CQ: *Are we going to see this rolling out on 2019 vehicles?*

Coleman: I don't think we said exactly when anything's happening <laughs>. ■