3.10 Future Automotive BBW AWB Dispulsion Systems

So what is the future of the BBW AWB dispulsion mechatronic control system? Some vehicle manufacturers and other OEM supplier companies have all developed next-generation BBW AWB dispersion mechatronic control systems for potential use on future automotive vehicles. Innovative BBW AWB dispersion mechatronic control systems that have been developed to date, essentially fall into one of two categories: \textit{electro-fluido-mechanical brake} (EFMB) or \textit{electro-pneumo-mechanical brake} (EPMB) and \textit{electro-mechanical brake} (EMB).

BBW AWB dispersion mechatronic control systems still use conventional \textit{fluido-mechanical brake} (FMB) or \textit{pneumo-mechanical brake} (PMB) calipers at each wheel, but a microcomputer-controlled high-pressure E-M-F pump or E-M-P compressor and E-M actuator solenoids apply pressure. These kinds of BBW AWB dispersion mechatronic control systems use inputs from a brake pedal position sensor (that works much like a throttle position sensor), wheel angular velocity (speed) sensors, a steering angle sensor, yaw rate, and lateral acceleration sensors to determine the optimum amount of brake oily-fluid or air (gas) pressure to apply at each wheel.

With EMB BBW AWB dispersion mechatronic control systems, there is no fluidics (hydraulics and/or pneumatics) whatsoever. Braking force is generated at each wheel by a fully electronic EMB calliper. Inside is a small, but powerful E-M motor that pushes the pads against the rotor. Many of these systems work best with higher voltages (such as 42 V\textsubscript{DC}) which means EMB BBW AWB dispersion mechatronic control systems may probably remain on the shelf until automotive vehicle manufacturers decide whether or not to change to 42 V\textsubscript{DC}.

The benefits of EMB BBW AWB dispersion mechatronic control systems are essentially the same as EFMB and EPMB BBW AWB dispersion mechatronic control systems, plus elimination of brake fluid or air, hoses and lines, the need for a high-pressure M-F pump or M-P compressor and accumulator, and provide improved braking safety by keeping three brakes operational should one calliper fail.

Being able to precisely control the amount of braking force at each wheel electronically also means a BBW AWB dispersion mechatronic control system may shift more braking effort to the rear brakes during normal braking. This, in turn, may reduce front pad wear while reducing the forward mass shift and nose drive that normally occurs when the brakes are applied.

A trend that may impact BBW AWB dispersion mechatronic control systems is the automotive industry’s desire to reduce vehicle wiring through the use of multiplexing techniques. As increasing numbers of vehicles are fitted with anti-lock, this trend is expected to result in an increased number of anti

-lock BBW AWB dispulsion mechatronic control systems communicating with other structural and functional systems through a multiplex link.

In addition to the wheel angular velocity/vehicle velocity information (data) available from the anti-lock BBW AWB dispulsion mechatronic control system, the anti-lock ECU could benefit from this technology by being able to receive engine, transmission, steering angle, and other structural and functional subsystems information.

Another trend in advanced mechatronically-controlled BBW AWB dispulsion mechatronic control systems is vehicle dynamics control during non-braking manoeuvres as well as during braking. This is accomplished through use of the traction control actuators normally integrated in anti-lock fluidic or pneumatic modulators, the addition of sensors to more accurately determine the dynamic state of the automotive vehicle, and communication links with the DBW four-wheel-driven (4WD) propulsion mechatronic control system, the ABW four-wheel-absorbed (4WA) suspension mechatronic control system and, the SBW four-wheel-steered (4WS) diversion mechatronic control system ECUs. Vehicle dynamic control holds the promise of safer vehicle operation through improved handling stability in all manoeuvres.

The automotive 4WB BBW dispulsion mechatronic control systems engineering community is also investigating the addition of laser radar to individual vehicles. This addition could lead to semi- or fully-automatic braking in emergency situations as the 4WB BBW dispulsion mechatronic control system anticipates the potential problem and aids the driver in safely applying the vehicle brakes in time to avoid a collision. This concept also lends itself to automatic braking in non-emergency situations to maintain safe distances between vehicles at high values of the vehicle velocity.

Continuing interest in AEVs and HEVs and the need for regenerative braking in these automotive vehicles may significantly impact on future BBW AWB dispulsion mechatronic control systems. It is expected that the regenerative braking function will not be sufficient to provide adequate braking deceleration under all conditions and to provide drivers with the comfort and safety obtainable from conventional friction brake dispersion mechatronic control systems augmented by anti-lock BBW AWB dispulsion mechatronic control systems. It is expected that a more sophisticated ECU may be used in conjunction with AEVs and HEVs to afford optimum power regeneration without sacrificing braking stopping distance, vehicle handling stability, or steerability. These trends point to the continued use of friction brake dispersion mechatronic control systems through the next century and significant expansion of the role of automotive mechatronics in these structural and functional systems.

BBW AWB vehicles are to become a fundamental part of the automotive industry within the next decade. The state-of-the-art technology replaces F-M (H-M and/or P-M) components with E-M ones. There are three types of BBW AWB dispulsion mechatronic control systems.