



## AUTOMOBILE

### *Application: Electronic Valve Control*



Variable valve lift is a technology, which is increasingly used in automotive piston engines. It varies the height that a valve opens, in order to improve performance, fuel economy or emissions. In 2001, BMW introduced

the Valvetronic system; this system can continuously and precisely vary intake valve lift. The precise control the system has over the intake valves allows for the intake charge to be controlled entirely by the valves, eliminating the need for a throttle valve and greatly reducing pumping loss. The reduction of pumping loss accounts for a 10-15% increase in power output and fuel economy.

### *Project: Direct Valve Actuation*

Due to the success of the Valvetronic system, a further development of this concept was initiated, involving full electromechanical control of all intake and exhaust valves. This configuration enables additional efficiency and anti-pollution gains; for example, complete cylinders can be disabled. This configuration offers the greatest possible flexibility of motor control, both with respect to motor rotational speed and output torque.

### *MACCON contribution*

For this research project MACCON designed, manufactured and supplied special motors to operate the valves up to 6.000rpm. In order to reach this high speed and to reduce energy consumption, the actuators are supported by resonant, torsional springs, which are able to maintain the basic motion cycle needed. The kinematics are thus mechanically self-supporting; the motors modify the motion cycle as needed for the speed and torque currently required from the combustion engine.

The prototype valve actuators are driven and positioned by the SWM controller under CANbus communication

