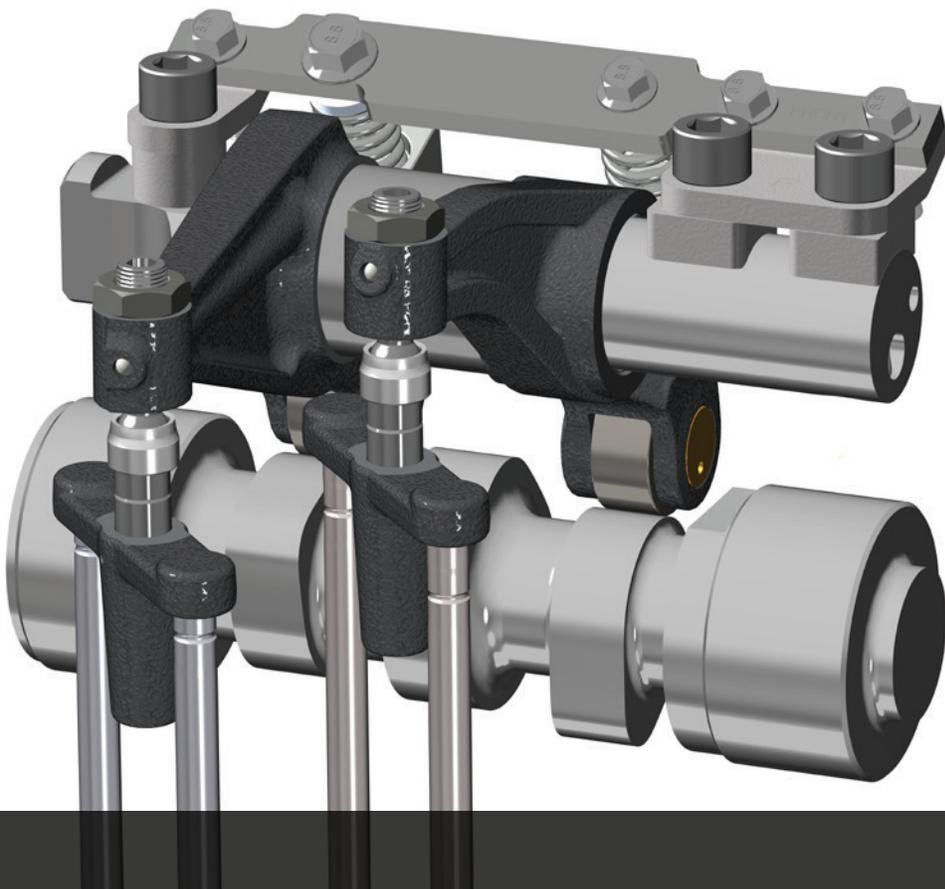




CDA

CYLINDER
DEACTIVATION



FOR IMPROVED FUEL ECONOMY & EXHAUST THERMAL MANAGEMENT

Cylinder Deactivation leverages Jacobs' well-established componentry to disable engine valves in selected cylinders which allows a large engine to have the fuel economy of a smaller engine. Also, higher exhaust temperatures in operating cylinders maintain aftertreatment temperatures at low load conditions and start-up.

- ▶ Fuel economy improvements through reduced pumping losses and friction
- ▶ Faster engine and aftertreatment system warm-up
- ▶ Improves combustion and fuel consumption in firing cylinders
- ▶ Improves emissions by keeping the aftertreatment system hot during low load operation
- ▶ Minimizes cooling of aftertreatment during coasting
- ▶ Hydraulically actuated mechanism integrates into pushrod or bridge
- ▶ Modular with High Power Density® engine brake technology
- ▶ An optional feature of Jacobs Lost Motion VVA

BENEFITS

Durability

Jacobs' CDA hardware has been demonstrated on multiple heavy duty engine platforms and has been road tested on various vehicles. As of early 2018, 4,300 hours of durability testing have been performed on the CDA system with over 1.2 billion component cycles so far. The system has also undergone nearly 500 million cycles of fatigue and overload testing.

Meets Regulatory Requirements

Jacobs' Cylinder Deactivation is an ideal solution in response to California's low load drive cycle requirements.



RESULTS

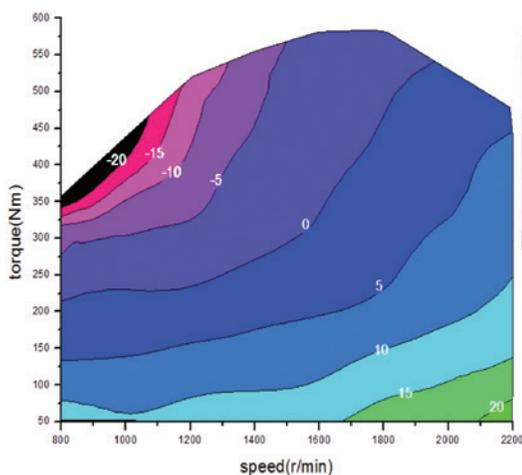
CDA improves fuel economy at low load conditions while increasing exhaust temperatures for optimal SCR operation.

- Up to 20% less fuel consumption at the lowest loads
- Fuel consumption improvement while still increasing exhaust temperatures over 6 cylinder operation

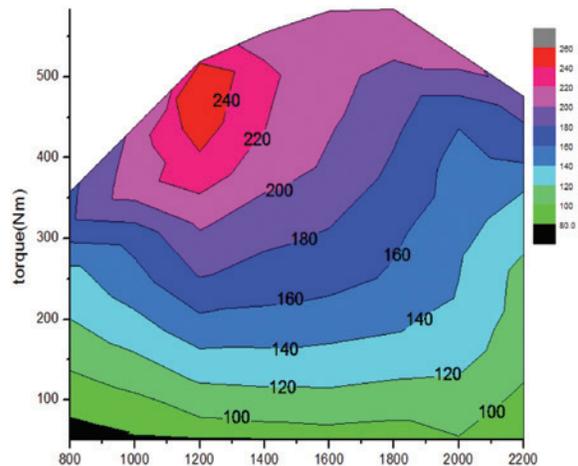
CDA offers improved emissions by keeping the aftertreatment system hot during low load operation. In addition, the system allows for faster engine and aftertreatment system warm-up.

- Increases temperature of 100-200° C delta at low load conditions
- Loads above approximately 15 kW and above consistently maintain temperatures above 250° C

Fuel consumption improvement with three cylinders deactivated (%)



Exhaust temperature increase (°C)



Note: Testing data from 3 cylinder deactivation on an inline 6 cylinder HD diesel engine