

Cummins Stage V Technology

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EU - Stage V Summary

- EU is the only region establishing the most stringent new regulations
- Cummins product plans for EU Stage V are to simplify the engine and utilize new single module aftertreatment systems
- The new Stage V products will be certified to EPA, KMOE and JMLIT T4F standards to enable single product usage in EU, US, Korea and Japan
- Rest of World versions of the Stage V engines will be released
- All Stage V project have begun with the B6.7 and L9 one year ahead of F3.8 and B4.5
- Current G12 and X15 T4F engine systems will be used for Stage V

Stage V Technology



What Are The Proposed Stage V PM Limits?

PM	Particulate Matter (Mass)	Particulate Matter (Count)
Stage IV	0.025 g/kW-hr	-not required-
Stage V	0.015 g/kW-hr	10 ¹² / kW-hr



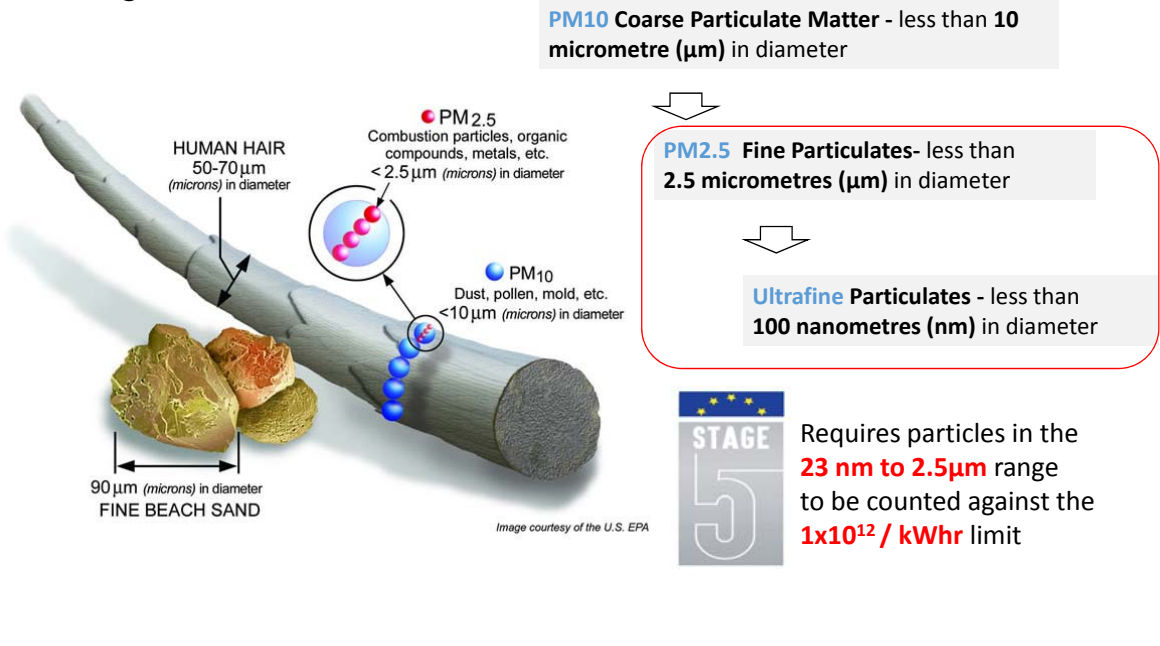
grams per kilowatt-hour

Max. amount by weight of PM emitted by each 1 kW engine output per hour

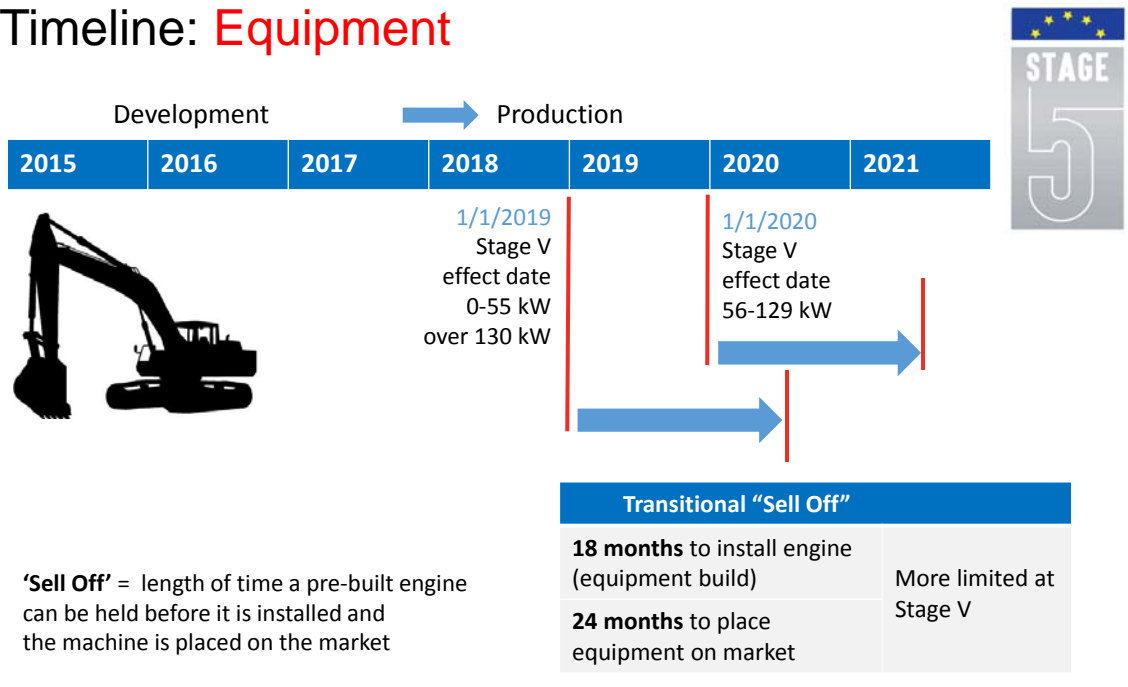
count per kilowatt-hour

Max. number of Particulates emitted for each kW engine output per hour
In effect, eliminates 99.9%

Looking At PM Size

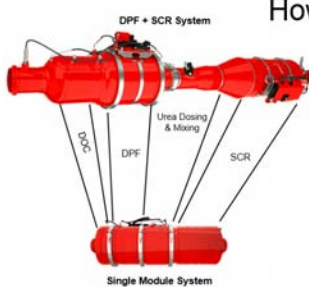


Timeline: Equipment



Power Categories: Emissions Levels

Power Category	Current Stage	Stage V	Effect
0-19 kW (24 hp)	not regulated	0.4 PM 7.5 NOx	2019
19-36 kW (24- 48 hp)	Stage IIIA	0.015 PM + Count 4.7 NOx	2019
37-55 kW (49-74 hp)	Stage IIIB	0.015 PM + Count 4.7 NOx	2019
56-129 kW (75-173 hp)	Stage IV	0.015 PM + Count 0.4 NOx	2020
130-560 kW (174-560 hp)	Stage IV	0.015 PM + Count 0.4 NOx	2019
over 560 kW (751 hp)	not regulated	0.045 PM 3.5 NOx	2019



How It Works

Full DPF + SCR system solution enabled by:

- UL2 Urea Dosing System (liquid system)
- Compact Mixer (helical design to enhance urea mixing capabilities upstream of the SCR)
- Enhanced catalyst technologies to optimize PM and NOx reduction

Stage V Design

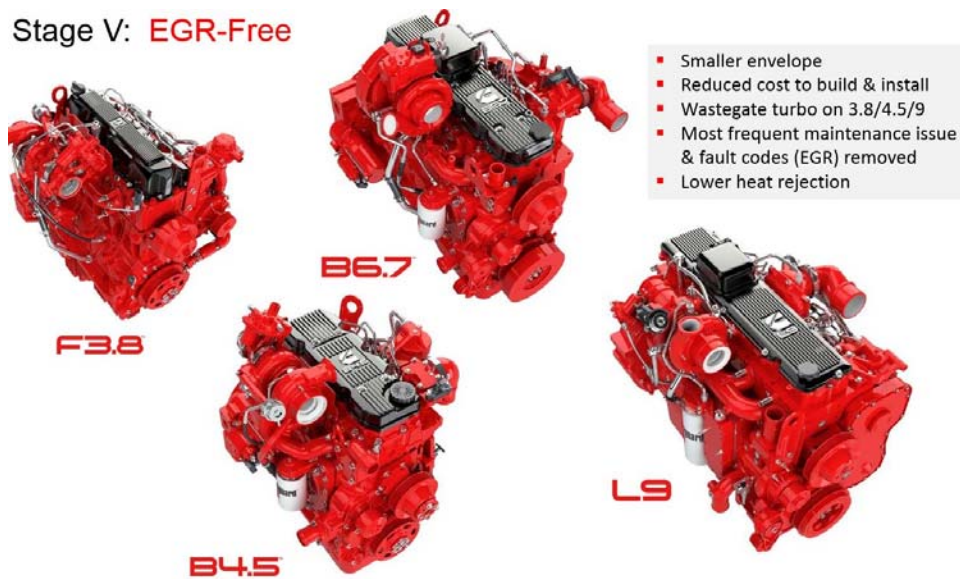
- Customer voice-driven design – it's not just about meeting emissions anymore, it's about meeting customer needs
- Stage V system offers*:
 - Up to **50%** reduction in space claim
 - Up to **30%** reduction in weight



Single Module™



Stage V: EGR-Free



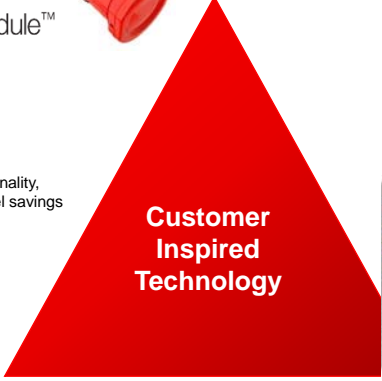
- Smaller envelope
- Reduced cost to build & install
- Wastegate turbo on 3.8/4.5/9
- Most frequent maintenance issue & fault codes (EGR) removed
- Lower heat rejection

Heavy Duty Ready for Stage V

- X15 and G12 Heavy duty engines use DPF aftertreatment for T4F/Stage IV
- The DPF makes engine system already Stage V capable
- Remaining task will be to certify current systems to Stage V in 2018
- Allows OEMs to focus on higher volume applications for installation work



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STAGE VISION

Up to 50% size reduction and 30% weight reduction, almost fully passive no operator intervention or dash lamps. Service cleaning extended way beyond current 5000 hours

Single Module™




Simplified EGR-free technology bringing 10% higher power and up to 20% higher torque – with less maintenance and fluid cost neutral. Universal engine platforms for all emissions.

Start/Stop Technology

A look ahead to Start-Stop functionality, able to realize fuel savings of 5% to 15%

Connected Diagnostics™

Advanced engine diagnostics telematics – enabling high levels of uptime availability – with access by app



Thank you for your attention!

Questions?

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