CIMAC

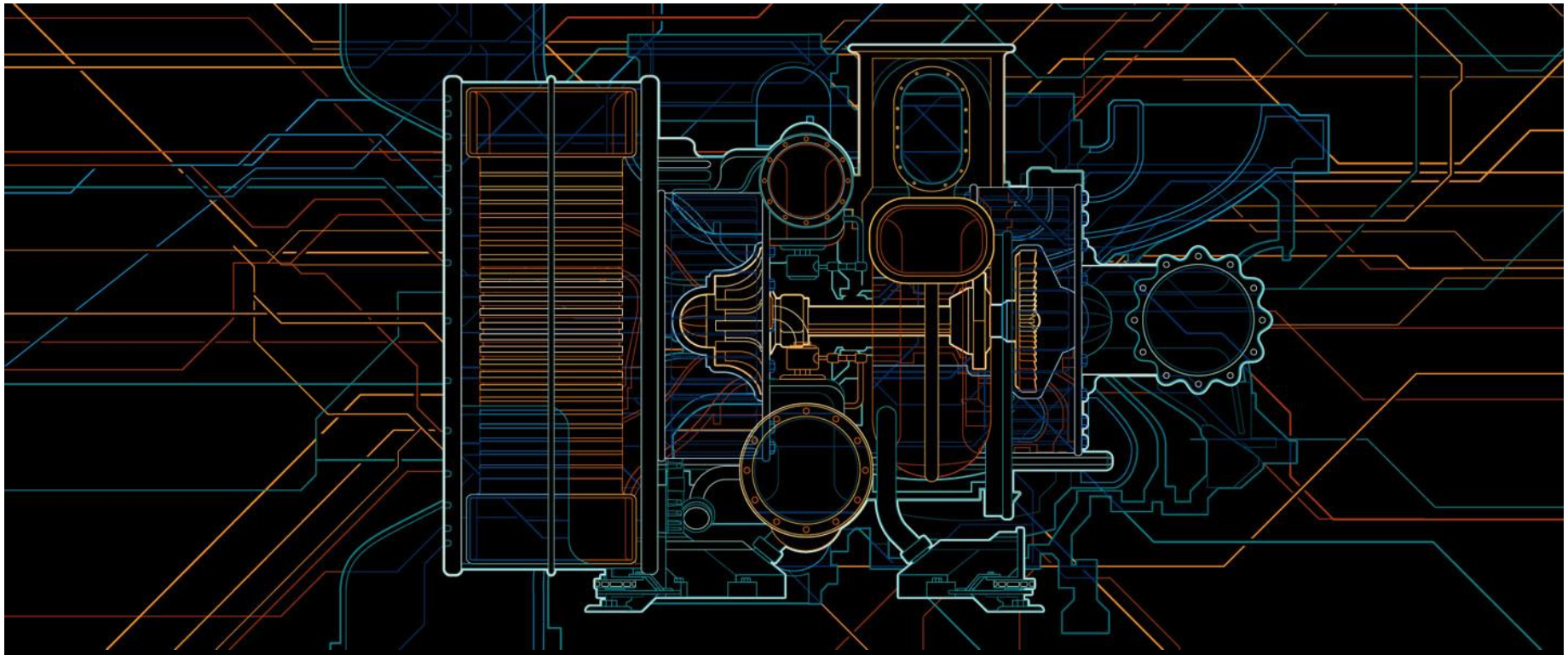
THE INTERNATIONAL COUNCIL ON COMBUSTION ENGINES

Are the times of single-stage turbocharging really over?

Markus Kahi

Amsterdam, 09 June 2015

ABB

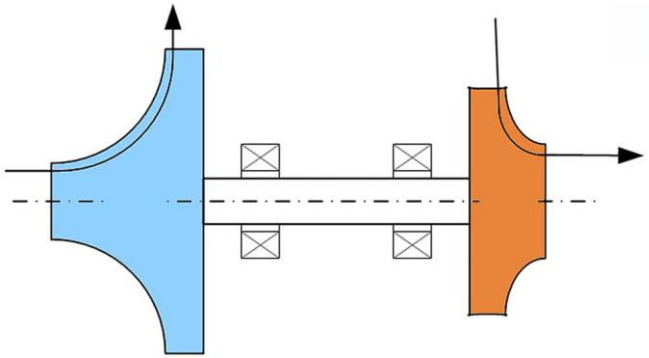


Markus Kahi, ABB Turbocharging

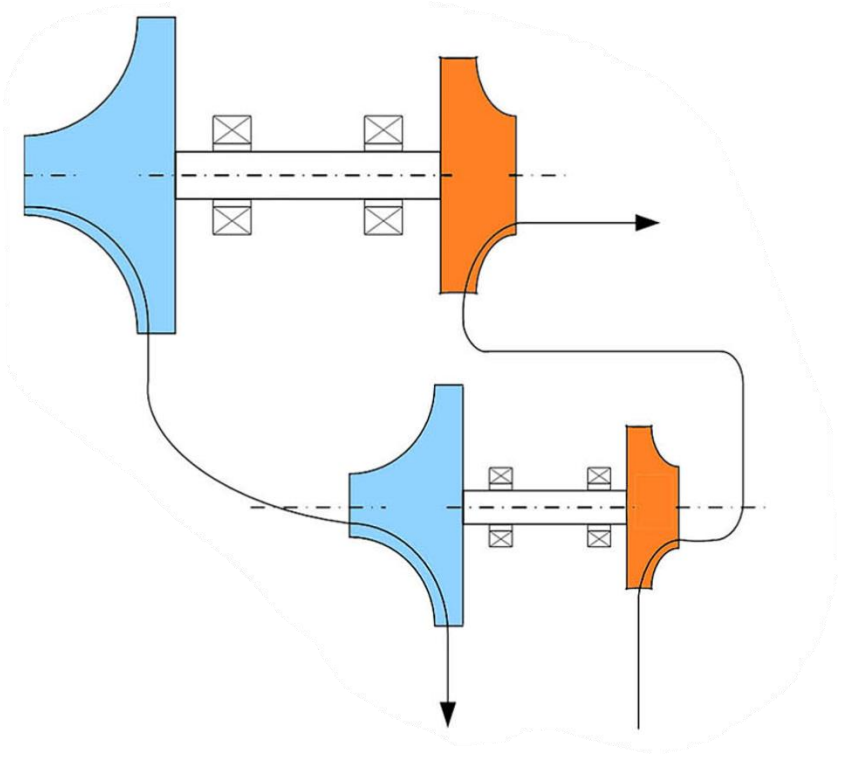
POWER-GEN Europe 2015
CIMAC panel discussion

2-stage turbocharging

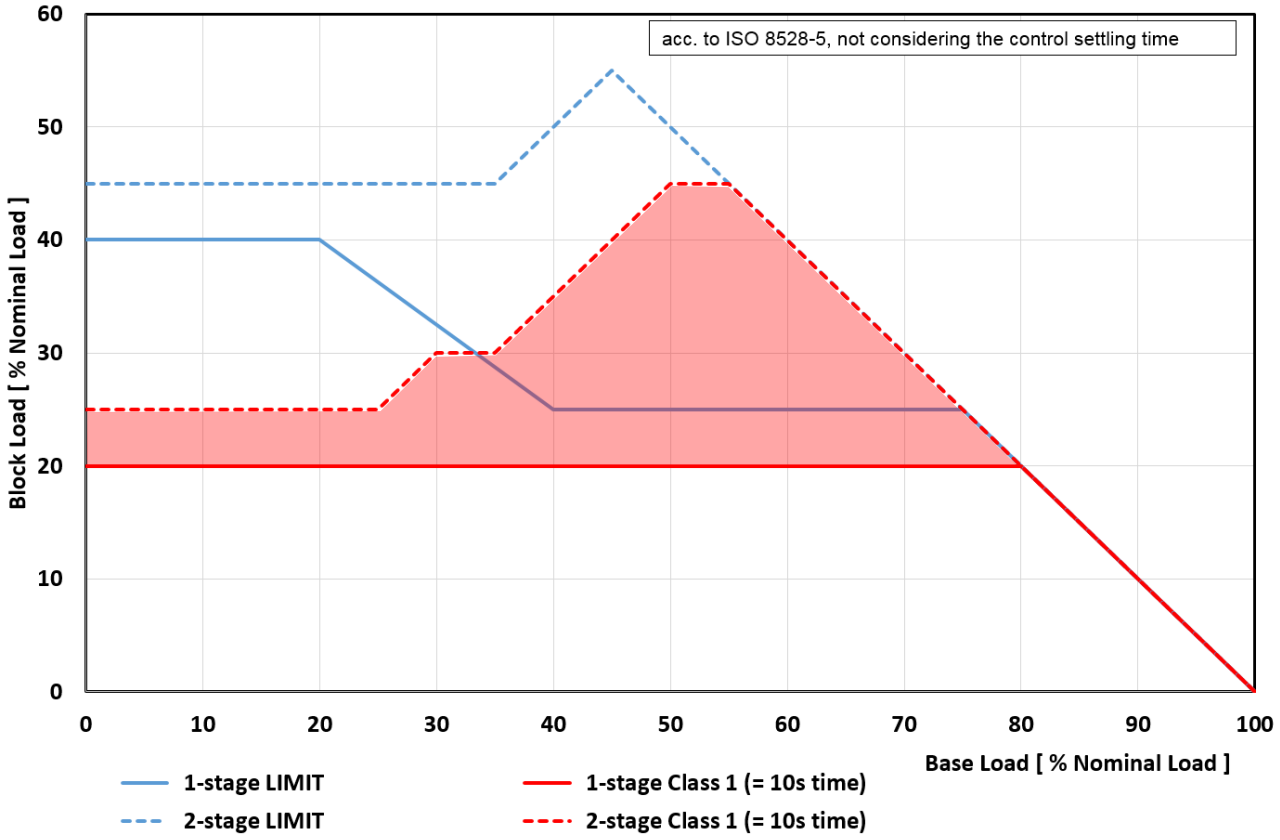
1-stage up to a pressure ratio of 6



2-stage for pressure ratios well over 10



Load pick-up capability Power2
Comparison 1-stage vs. 2-stage turbocharging



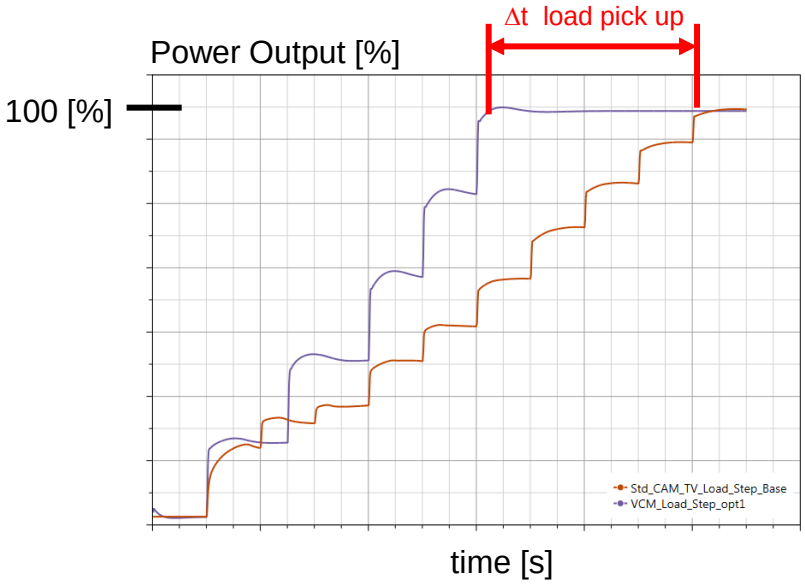
Determined on GE Jenbacher J624 engine

Nominal load:

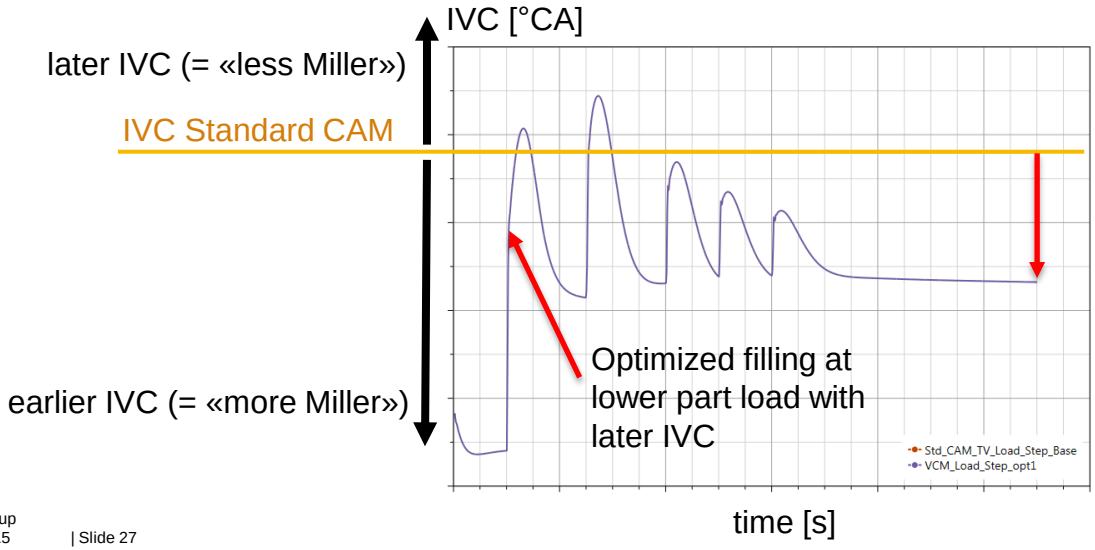
1-stage: 4’020 kWel

2-stage: 4’400 kWel

Load pick-up capability Power2 & VCM
2-stage turbocharging & variable inlet valve combined

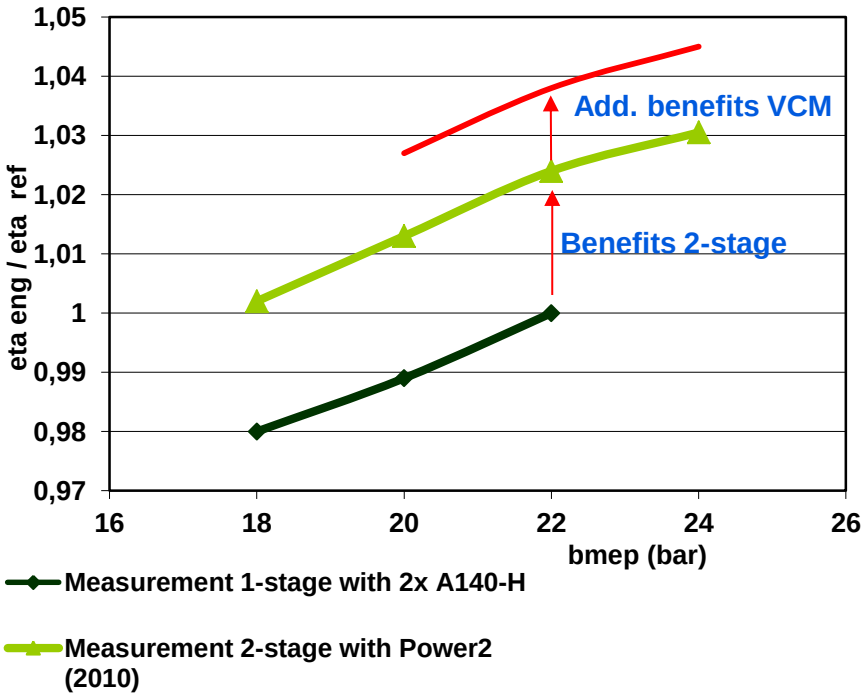


Calculated for high-speed gas engine, port injection & 2-stage turbocharging



Full load: earlier IVC to gain engine efficiency & enabling increased cylinder compression ratio

Fuel savings with 2-stage
Power2 – a worthwhile technology also for peaking ?



Benefits for a 5 MW gas engine:

Rhrs p.a.	3'000h	3'000h
Engine eff. improvement	+2% pts (Power2)	+3.5% pts (Power2 & VCM)
Electr. outp.	5MW	5MW
Fuel savings *)	€ 60'000	€ 105'000

*) base efficiency: 44%

gas price € 0.04 / kWh

Plus potential to increase bmep and optimise further!

➔ Even for a peak shaving application with 3'000 rhrs p.a. the fuel cost saving for the operator is substantial

So, are the times of single-stage turbocharging really over now?

No, they are not!
Customers' needs have common elements but with a different weight: CAPEX, TCO, Environment, Service cost, …

→ Different solutions required