



Auxiliary Drive System for Hybrid Vehicles

Patrick Debal
Punch Powertrain
20120613

- Introduction Punch Powertrain
- HEV powertrain concept
- Auxiliary drive concept
- System realisation
- Test results
- Conclusion

Introduction Punch Powertrain

Independant developer and producer of powertrain solutions

Punch Powertrain mother company in Belgium

- R & D
- Application projects
- Manufacturing of complete CVTs
- Manufacturing of key components (pulleys & hydraulic control block)



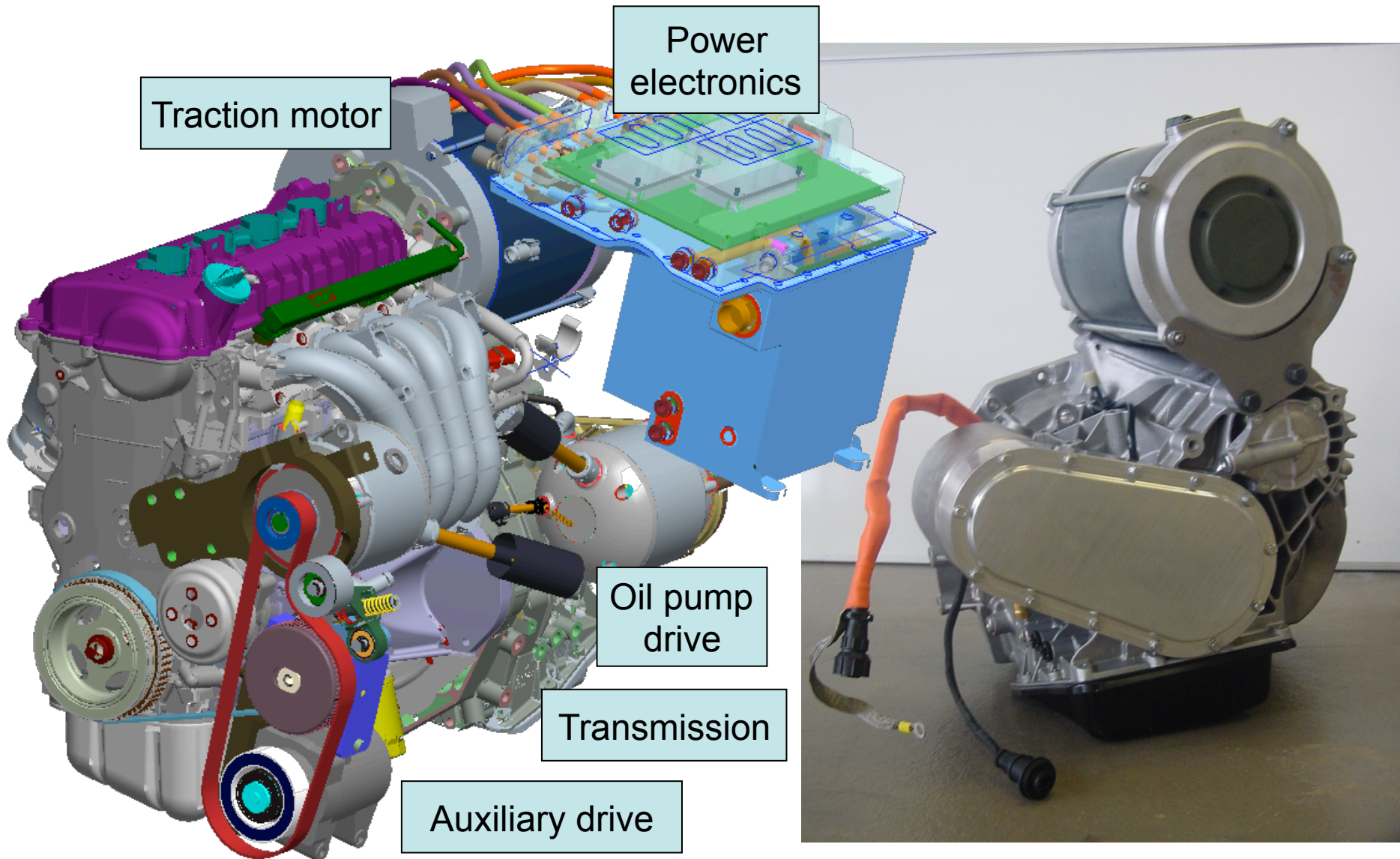
Introduction Punch Powertrain

Punch Powertrain – Nanjing

- 100% owned by Punch Powertrain Belgium
- Manufacturing of complete CVTs
- Operational since mid 2008
- Already 12 customers in China, 16 in total



HEV Powertrain Concept



HEV Powertrain Concept



High efficiency:

- Motor in POST position
- CVT allows in depth optimisation for efficiency
- Robust strategy developed
- Potential risk of battery depleting in slow traffic jam

➔ Auxiliary drive solution

Auxiliary Drive Concept

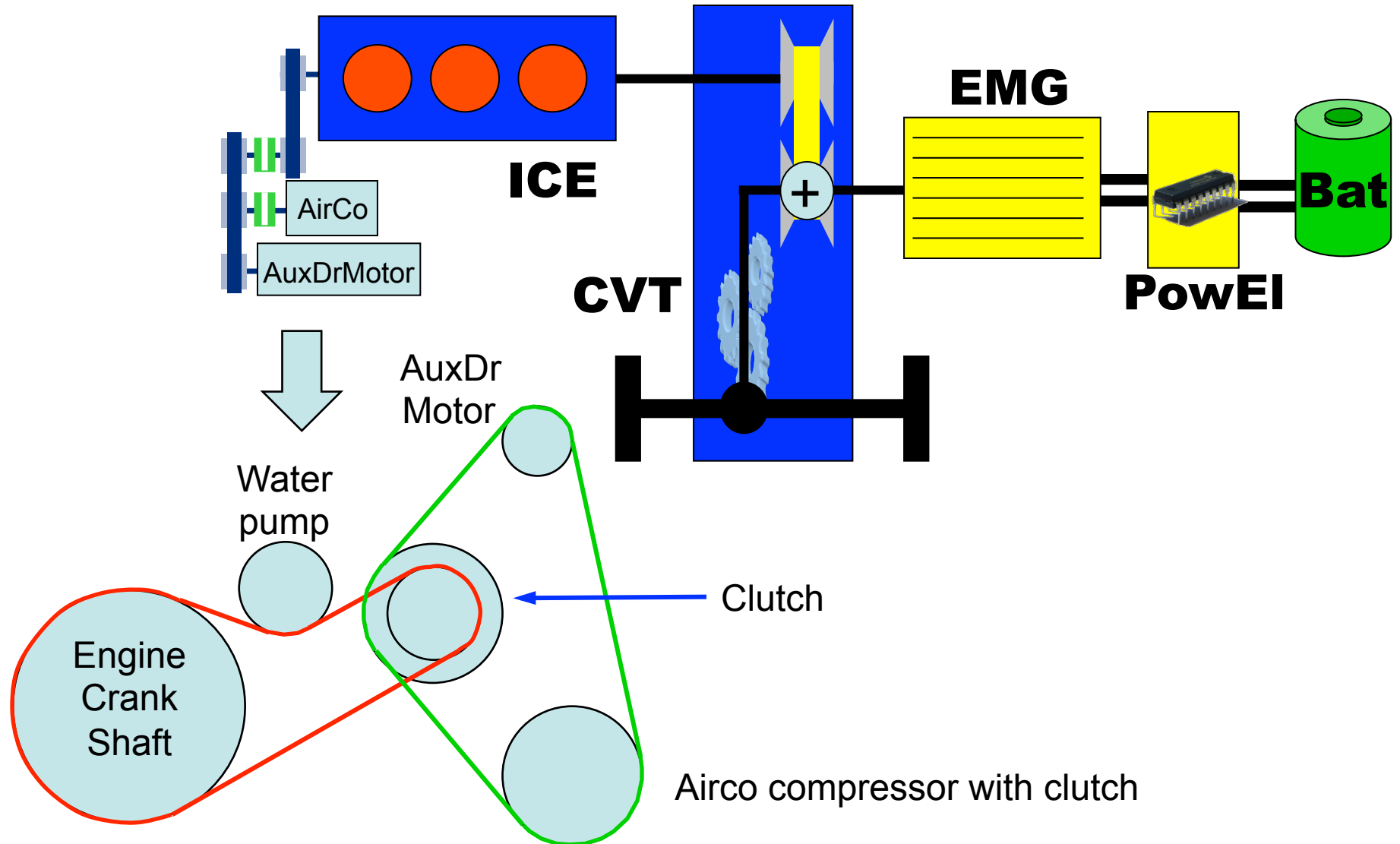
Required functions:

- Engine quick start
- Generator
- Fit into existing components envelope

Welcomed features and functions:

- Airco drive (engine independent operation)
- Existing high voltage motor/generator

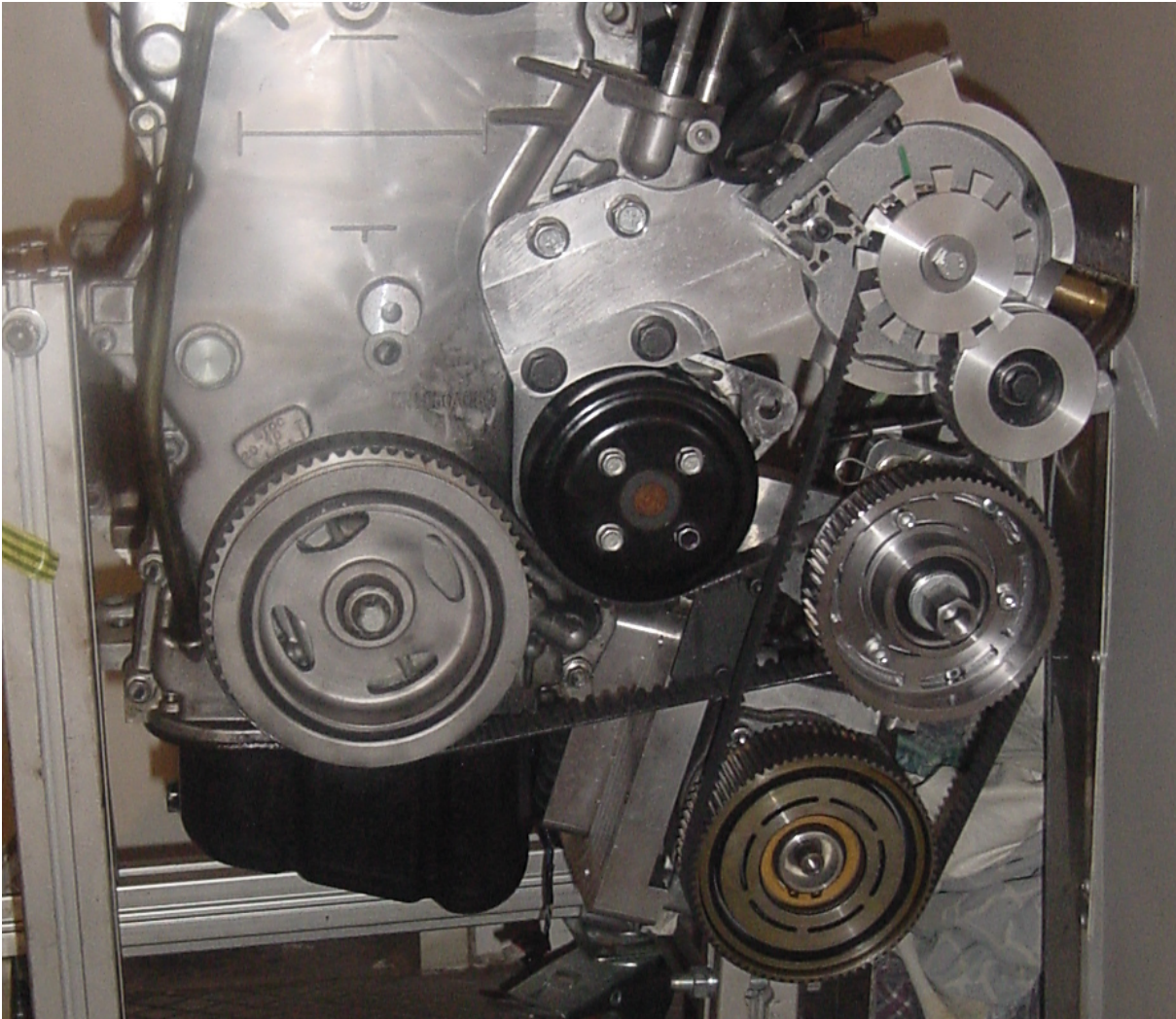
Auxiliary Drive Concept



System Realisation

Prototype on test:

- Motor in alternator envelope
- Autotensioner
- Dedicated clutch
- Version with timing belt (also poly-V)

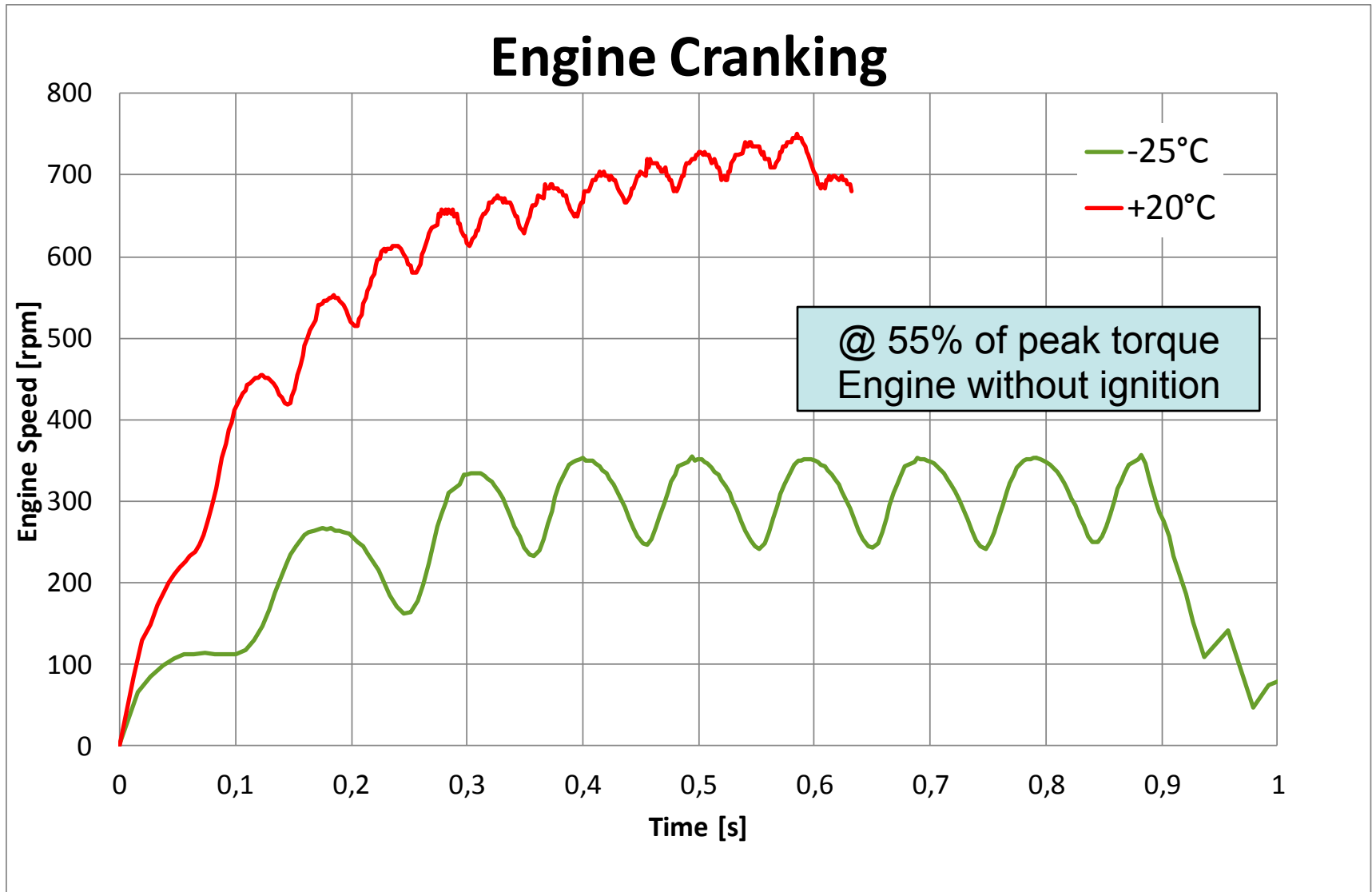


System Realisation

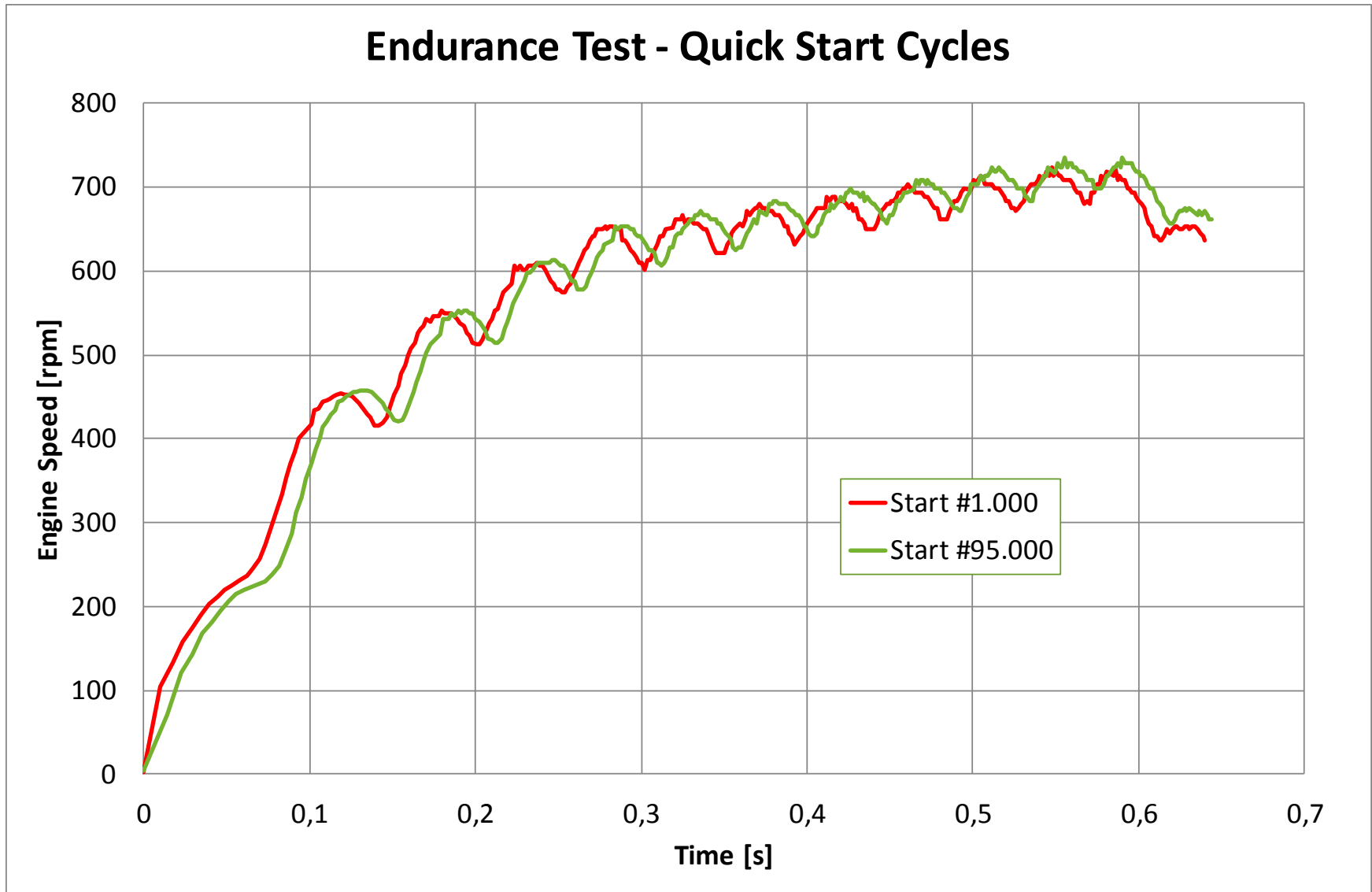
The performance of the auxiliary drive system on test:

- Engine cranking torque up to 120 Nm (@ 0 rpm)
- Airco drive @ 1,9 kW continuous power
 - EV-mode and steady state operation
 - Higher power possible by engine drive
- Generator @ 2,2 kW continuous power
 - Covers low speed EV-operation (< 10 km/h)
 - Allows some battery recharging

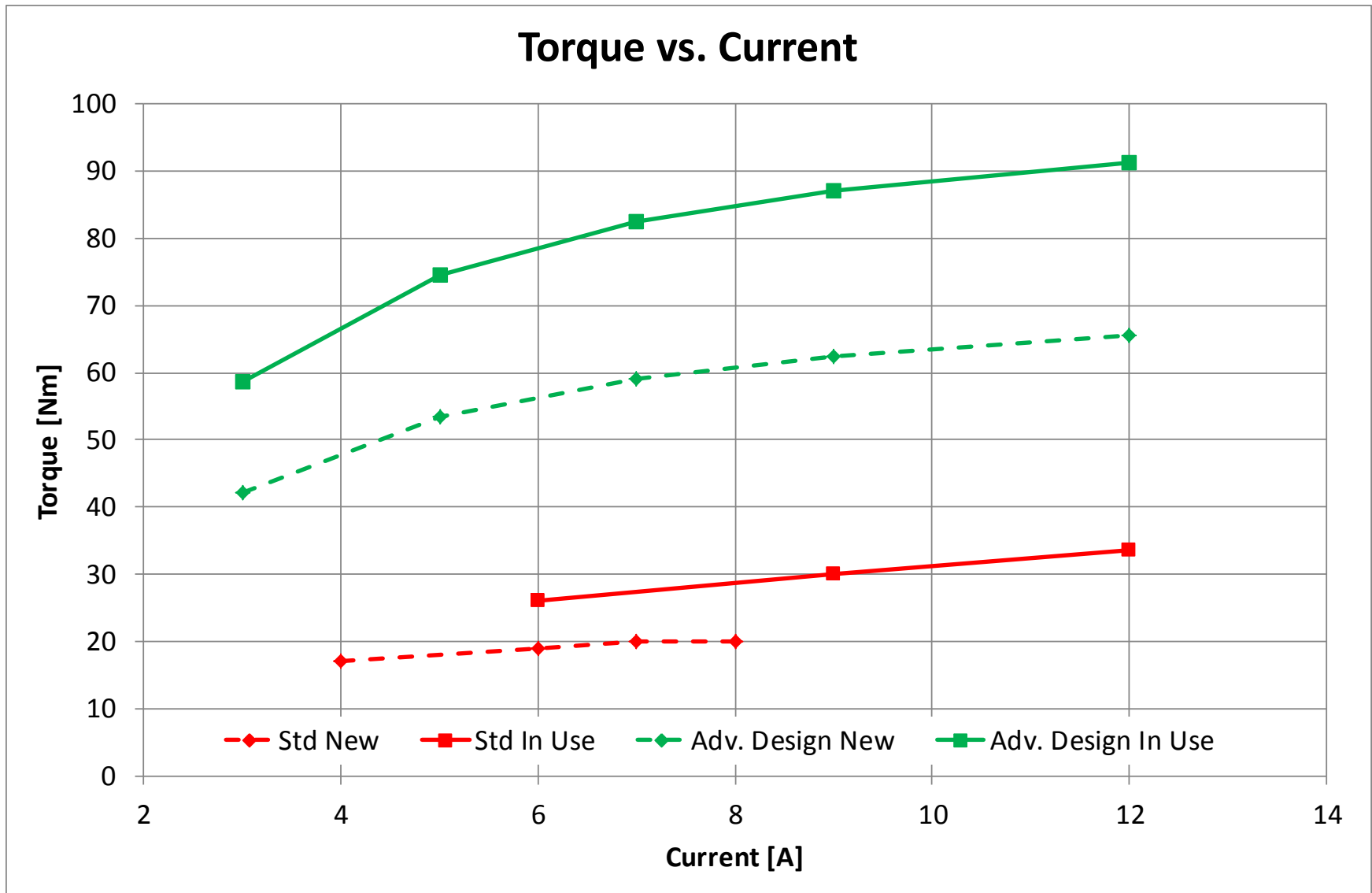
Test Results – Cold Start



Test Results - Endurance



Test Results – Clutch Torque



Conclusions

Punch Powertrain's auxiliary drive offers:

- Engine quick start
- Electric airco drive
- Back-up generator
- Within available space envelope
- Using advanced high torque electro magnetic clutch design

Thank you for your attention!