

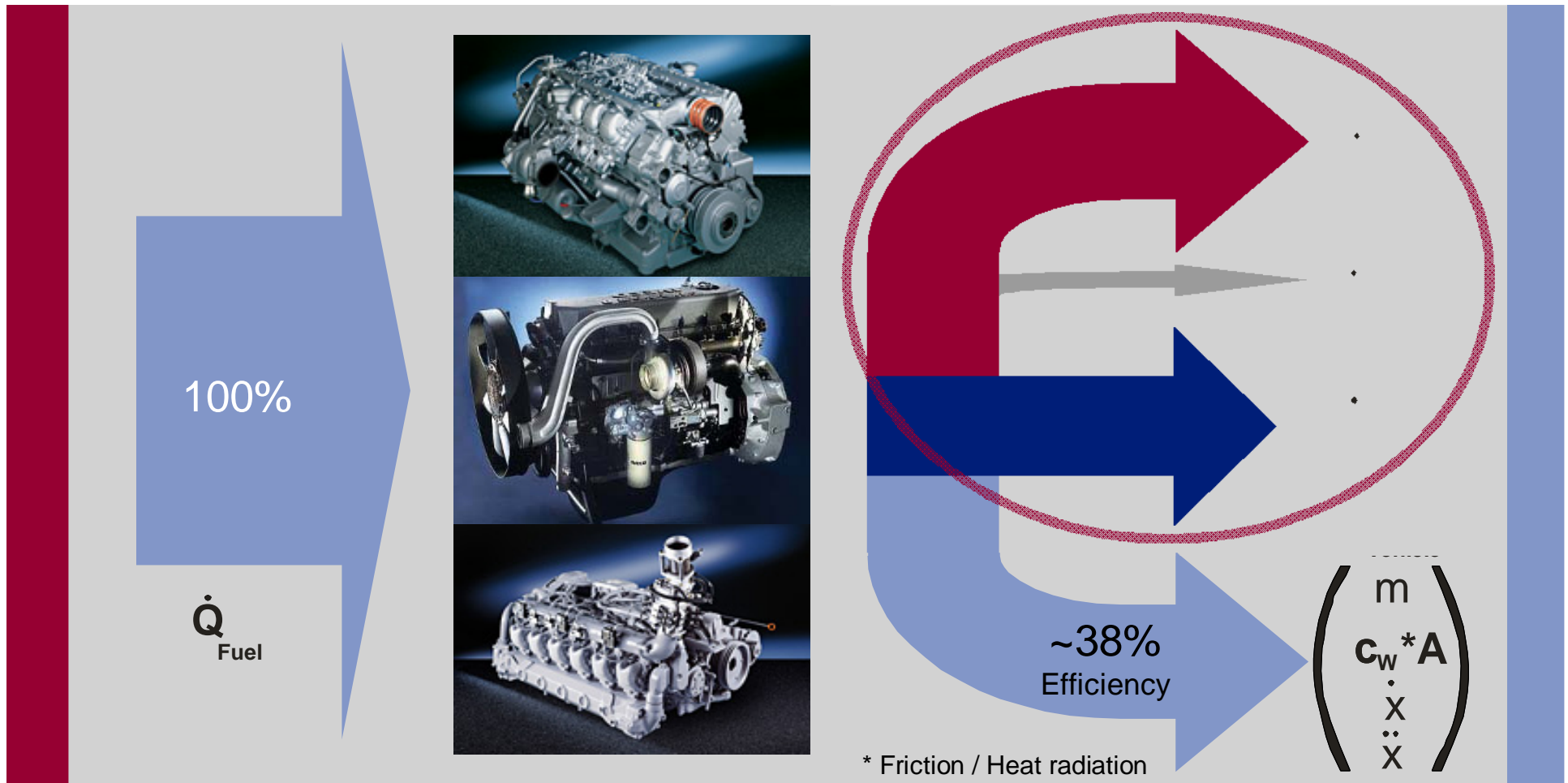


## Waste heat recuperation

- Voith Steamdrive
- Voith Steamtrac

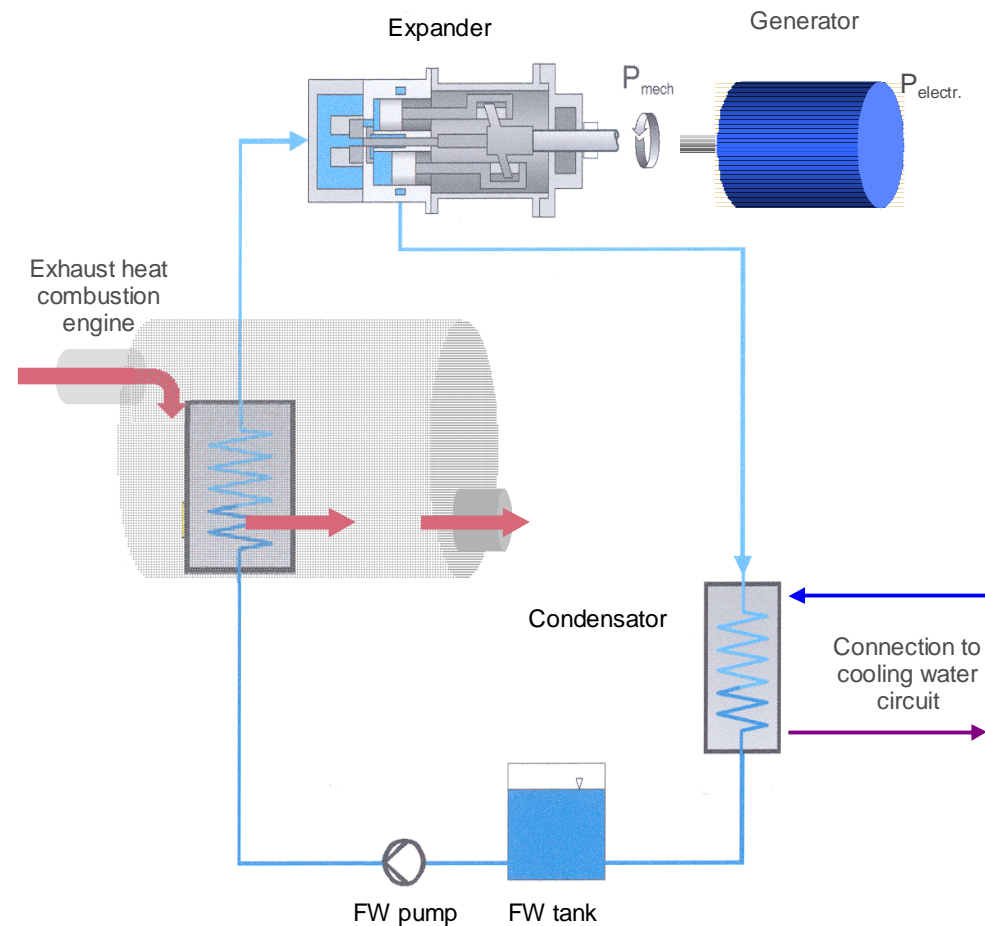
Berger-athi, 2008-01-09

# Steamdrive / Steamtrac Balance of a combustion engine



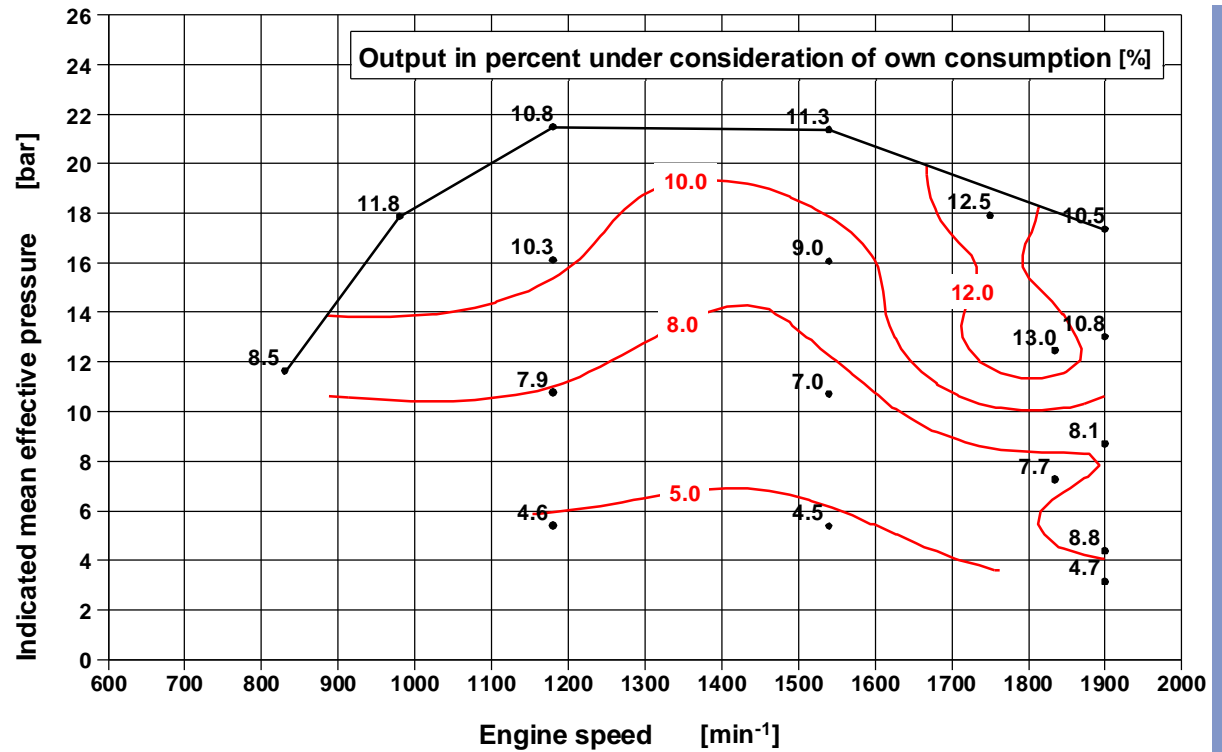
## Steamdrive / Steamtrac Basic Design

- Closed vapor cycle
- Expander energy to drive auxiliaries or traction
- Condensation due to connection to cooling system
- Vaporization by utilization of waste heat i.e. exhaust heat (EGR and residual exhaust gas)



# Steamdrive / Steamtrac

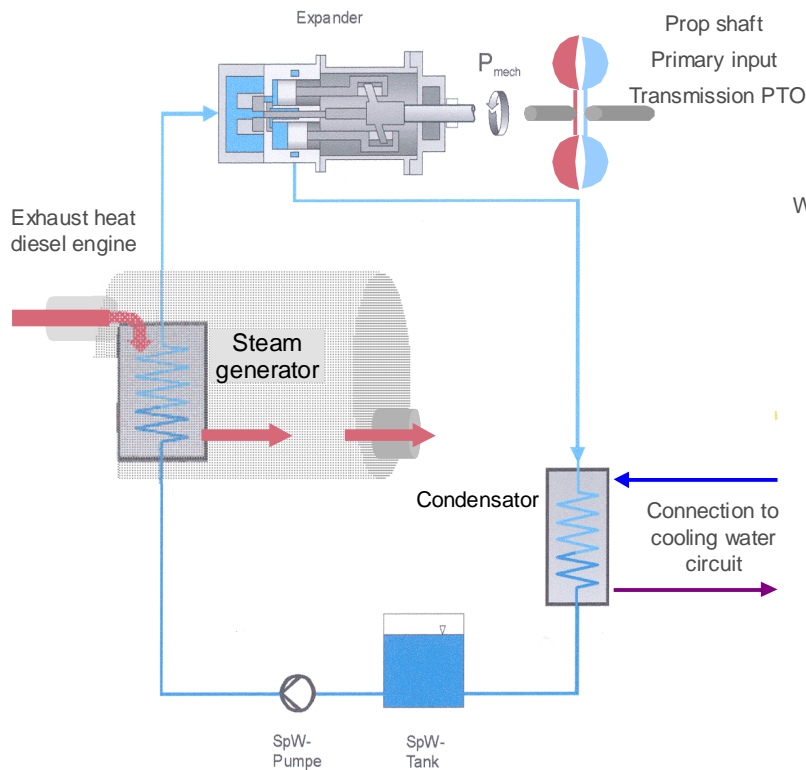
**Additional power potential from engine exhaust heat after turbo charger and recuperated engine exhaust heat.**



# Steamdrive / Steamtrac Utilization Examples

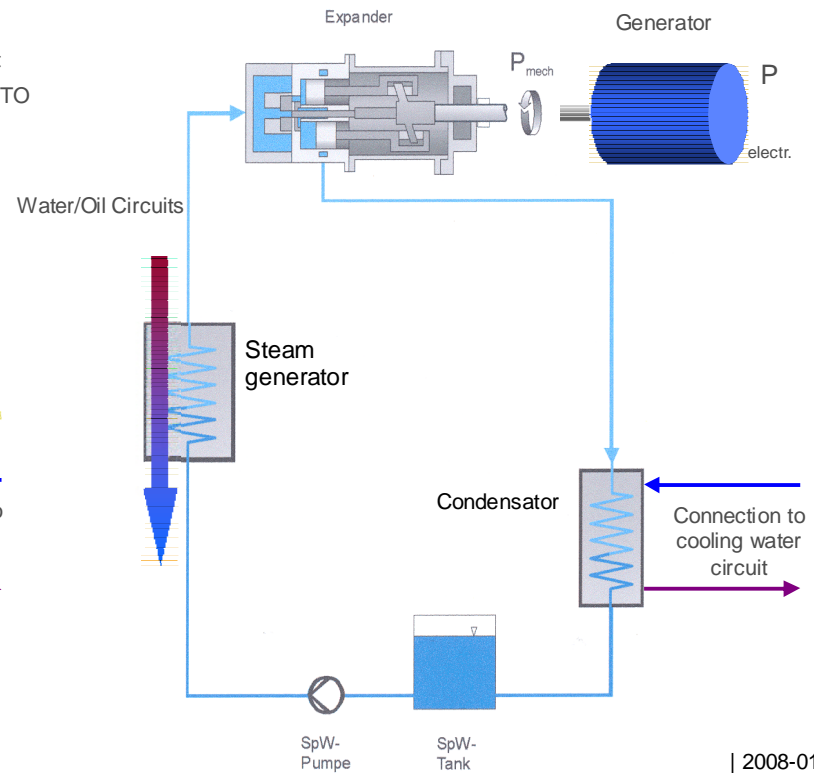
## SteamTraction

Boost operation using exhaust heat



## SteamDrive, Auxiliary

Generator, driven by heat dissipated from cooling system



## Steamdrive / Steamtrac Utilization Examples

Steam**Traction**



Steam**Drive, Auxiliary**



for both systems possible heat sources:

- exhaust
- EGR
- Retarder and transmission oil
- Cooling water
- Charge air
- Compressor
- ...

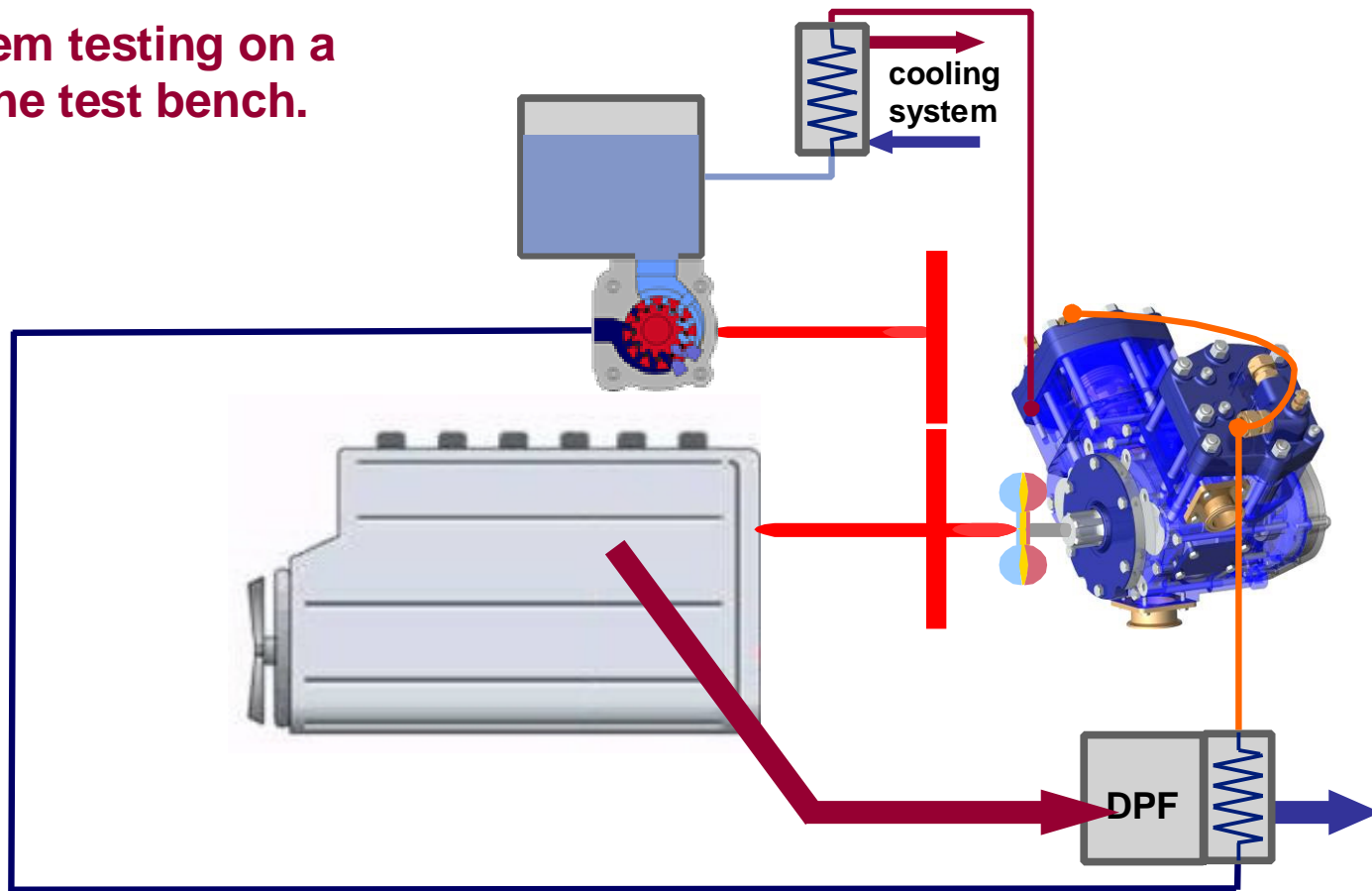
# Steamtrac Development and Testing Schedule

Expander, control system and feed pump tests on component test stand since 05/2007



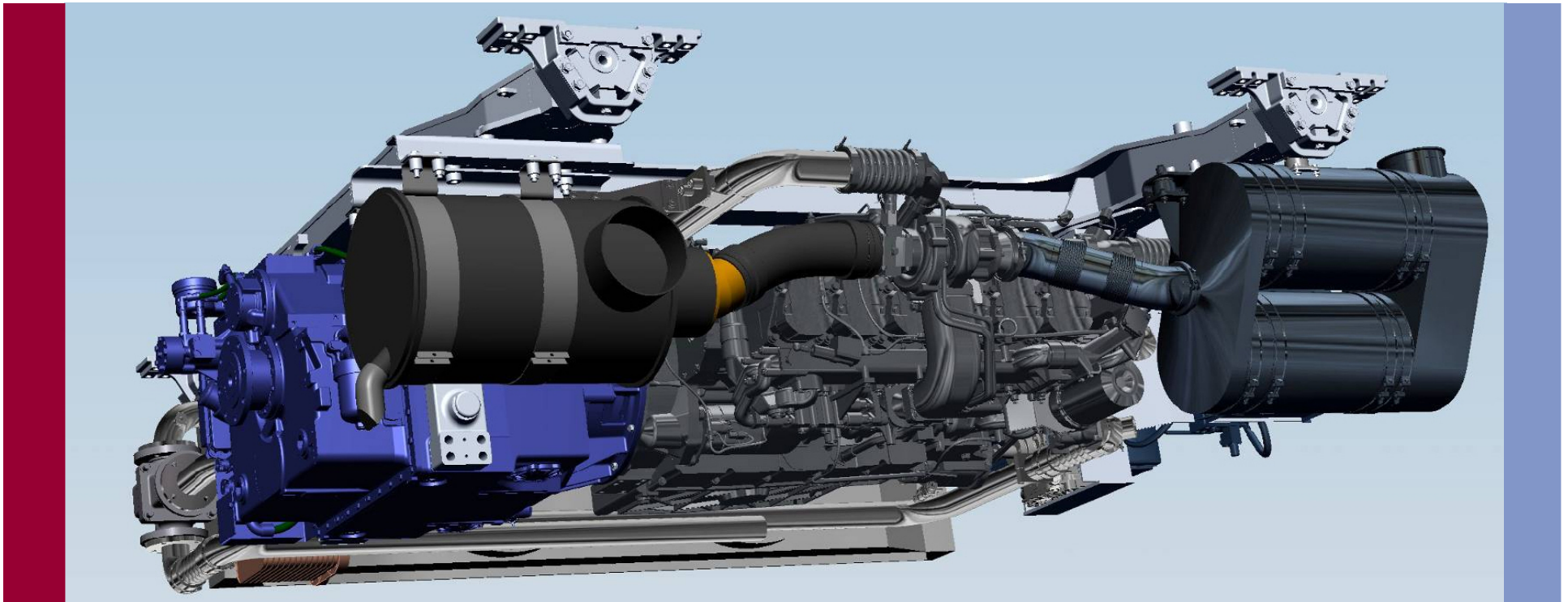
# Steamtrac Development and Testing Schedule

11/2007 system testing on a  
engine test bench.





## Steamtrac testing Rail Next Steps



**=> 2008 Steamtrac testing in Railpack on Railpack test bench**

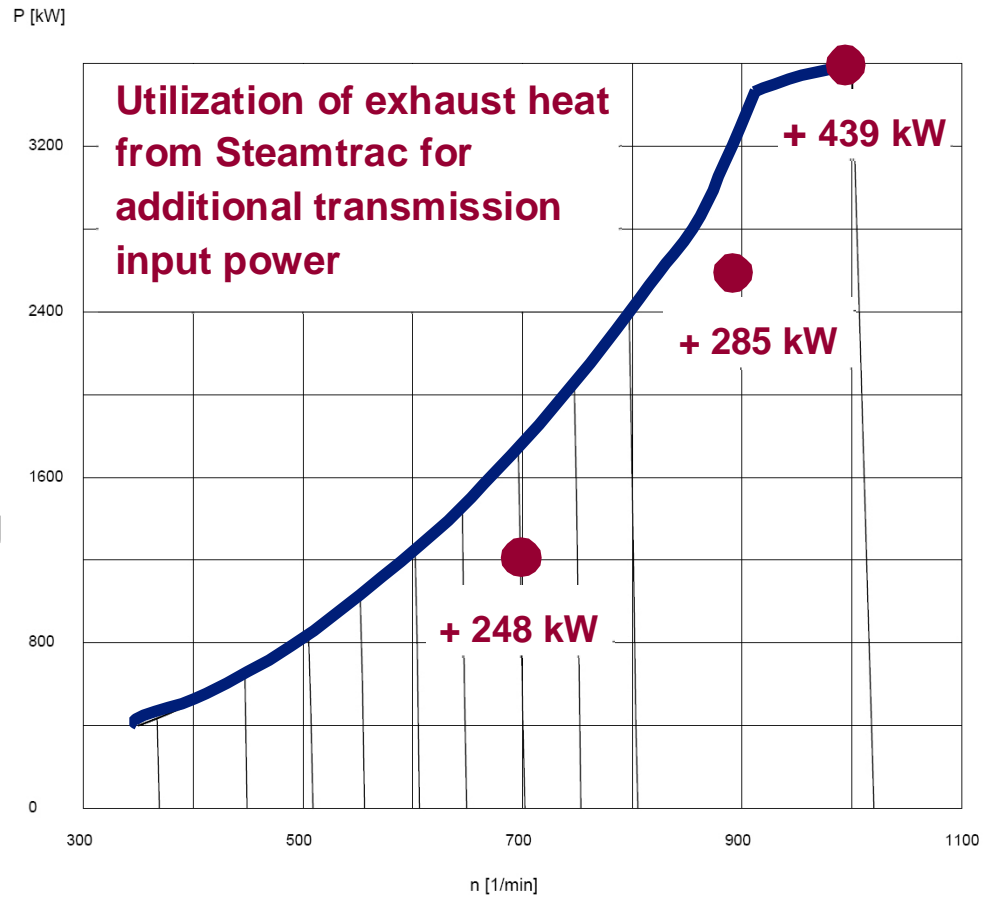
**=> 2008 Steamtrac testing in Railpack in a Railcar**

# SteamTrac

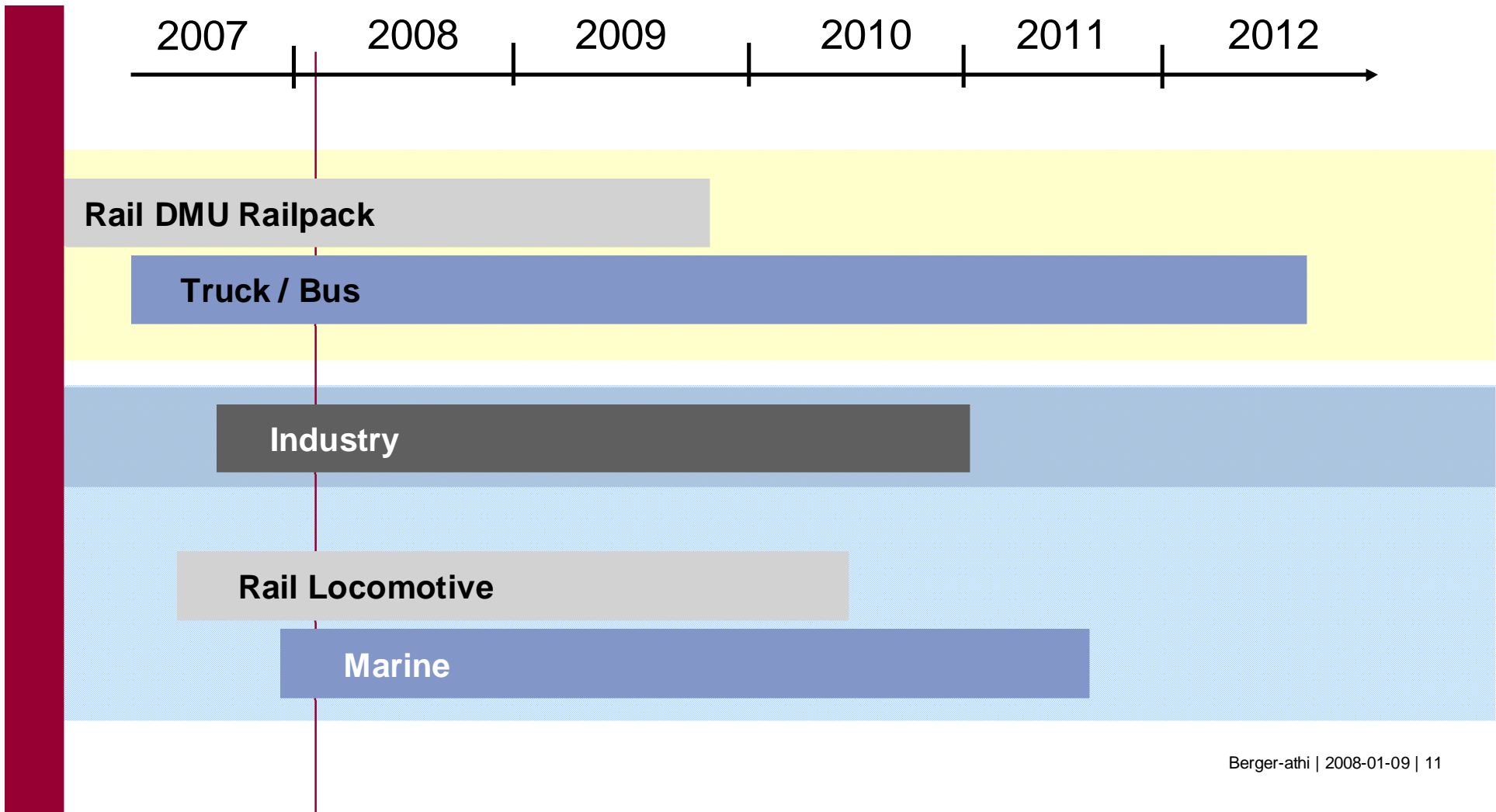
## Maxima 40 CC – 3600kW diesel engine



- Fuel savings across driving profile approx. 10 %
- 12 % higher performance at rated load
- 20 % higher performance at part load



# SteamDrive / SteamTrac Time scheduling



## **Voith Steamtrac / Steamdrive** **Applications outside of railcars**

### **Rail**

⇒ **DMUs / Locomotives / Auxiliary systems**

### **Road**

⇒ **Truck / Bus**

### **Industry**

⇒ **Engine test bench, block heat an power plant,  
pipeline compressor**

### **Marine**

⇒ **Ferries, Cargo ships**



# VOITH

*Engineered reliability.*