Durability of Diesel Particulate Filters – Bench Studies on Cordierite Filters

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Thermal Aging Conditions

Fuel Burner for Particulate Loading

- Degreened sample for 1 h at 550°C
- Average particulate loading = 4 g / L

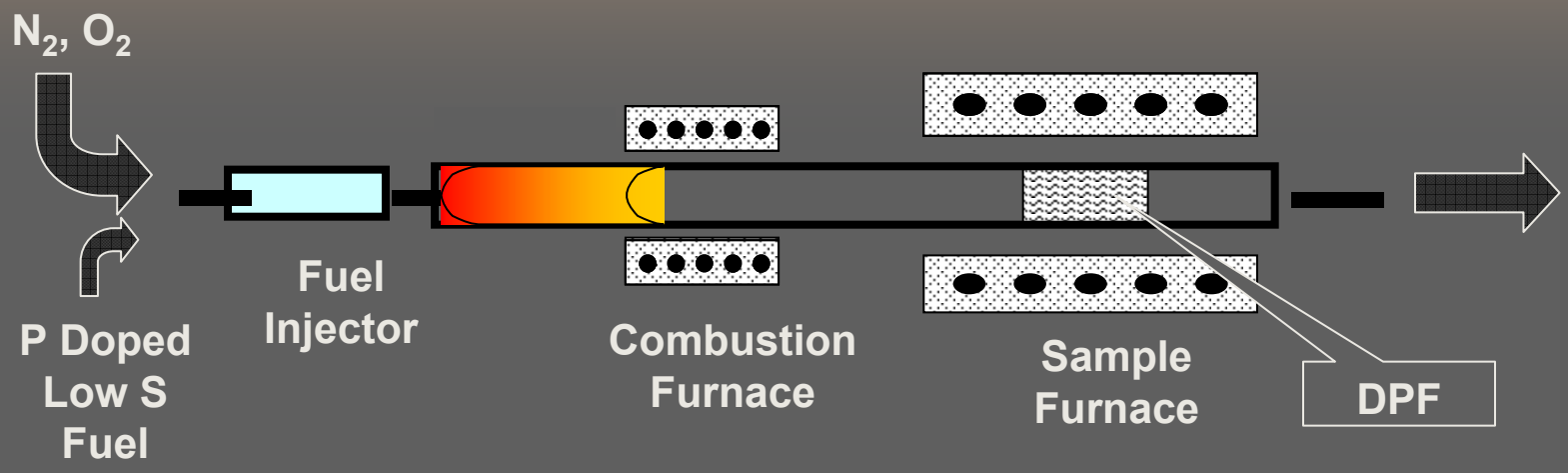
Thermal Aging

- 1" x 3" cores
- Aged for 200 h
  - 550°C for first 100 h
  - 650°C for last 100 h
- 6 L / min air with 10% humidity

Soot Regeneration

-Run on a Xytel reactor bench
- 300 ppm NO
- 9% O_2
- 6% water
- SV = 30K / h
- Ramp to 650°C @ 2.5°C / min

Phosphorus Aging System

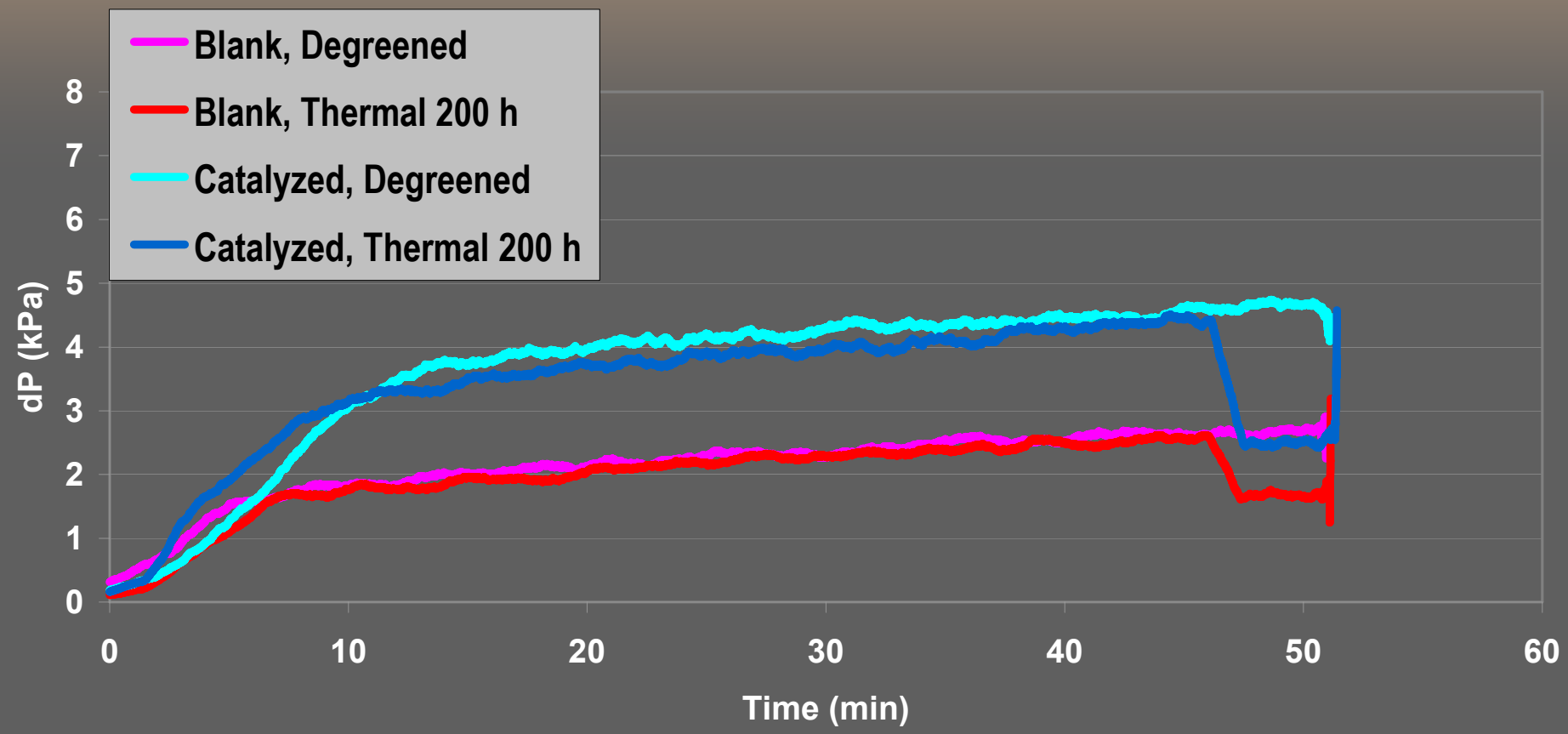


Phosphorus (P) source: 1% (TCP) Tri-Cresyl Phosphate [$(4\text{-}CH_3C_6H_4O)_3PO$]

Bench Exposure Time	Amount of P
200 min	8 (g / L)
400 min	16 (g / L)

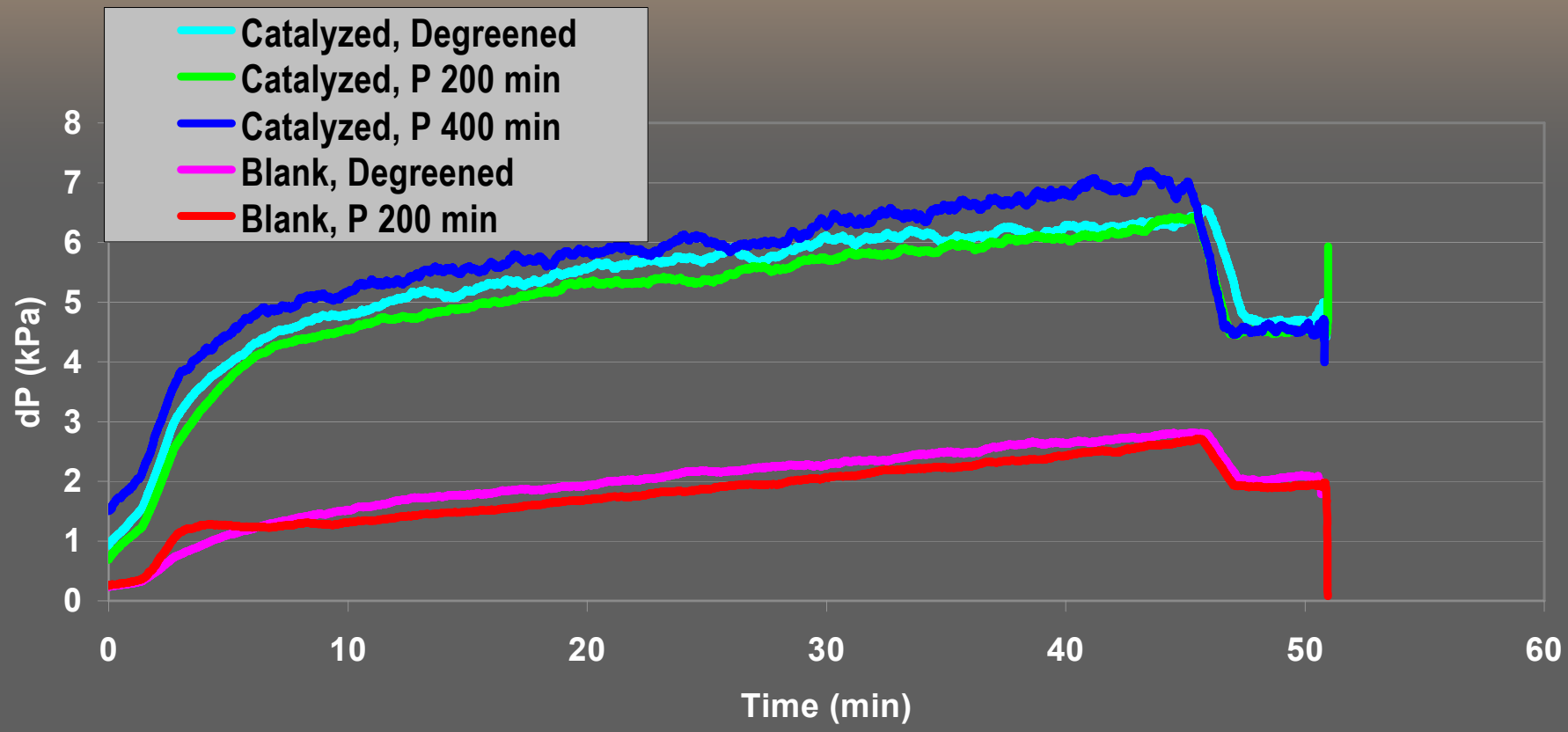
- **Bench system for accelerated phosphorus aging**
- **It simulates phosphorus deactivation due to combusted oil**

Pressure Drop and Thermal Aging



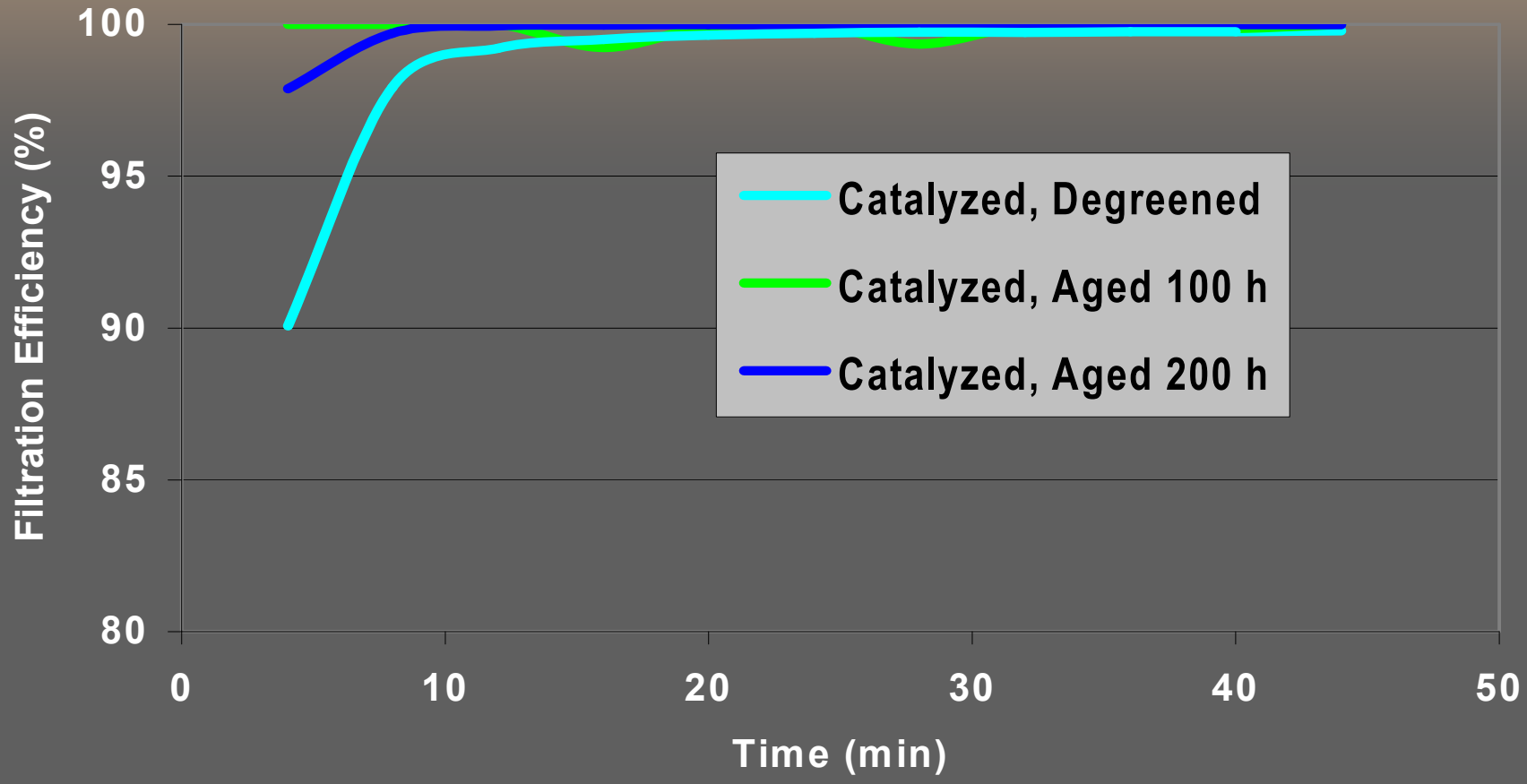
➢ Thermal aging of 200 hours has only a minor impact on pressure drop

Pressure Drop and Phosphorus Aging



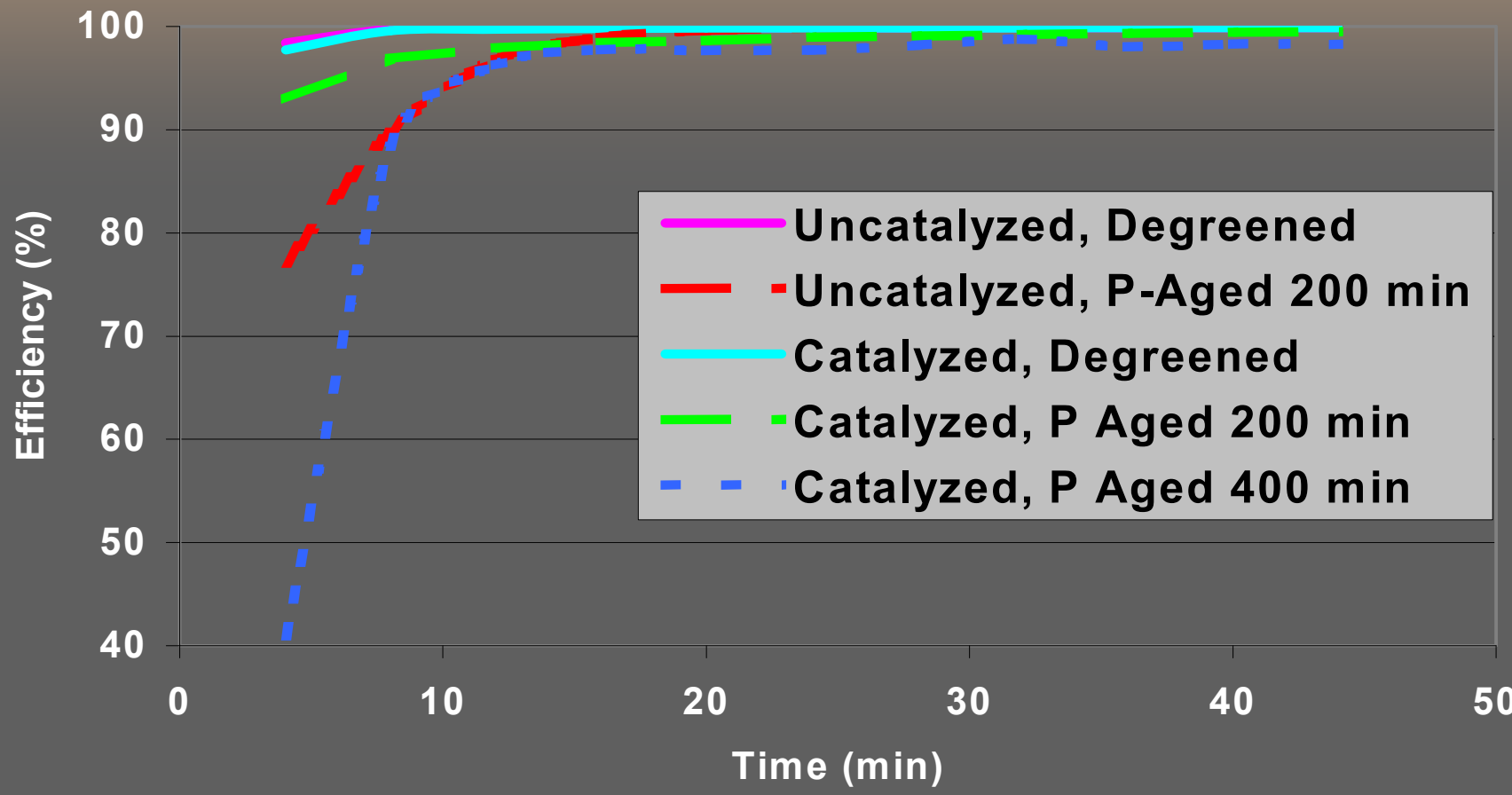
- Chemical aging by phosphorus has only a minor impact on pressure drop

Filtration Efficiency and Thermal Aging



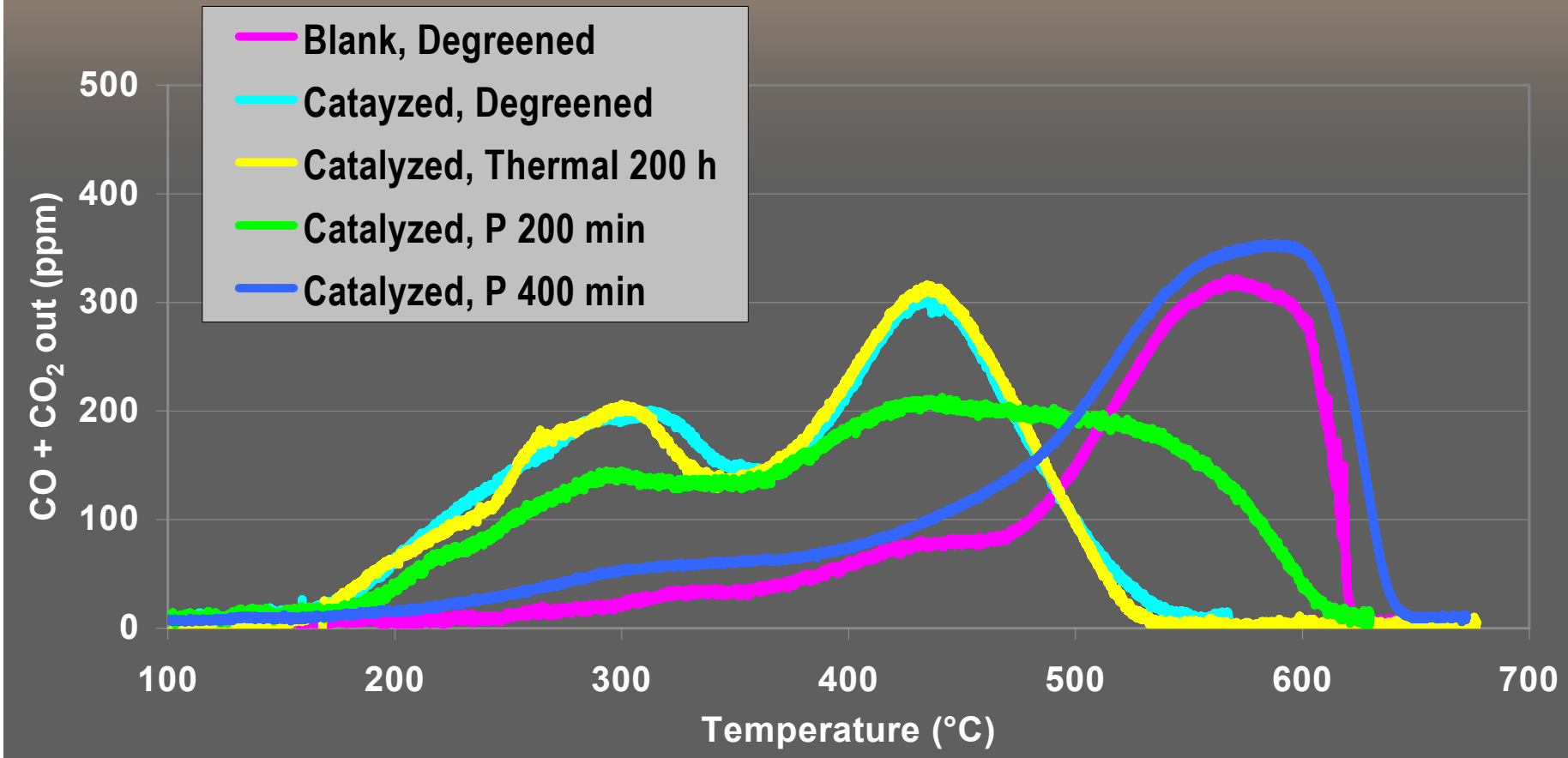
- Thermal aging of 200 hours has a minor impact on filtration efficiency

Filtration Efficiency and Phosphorus



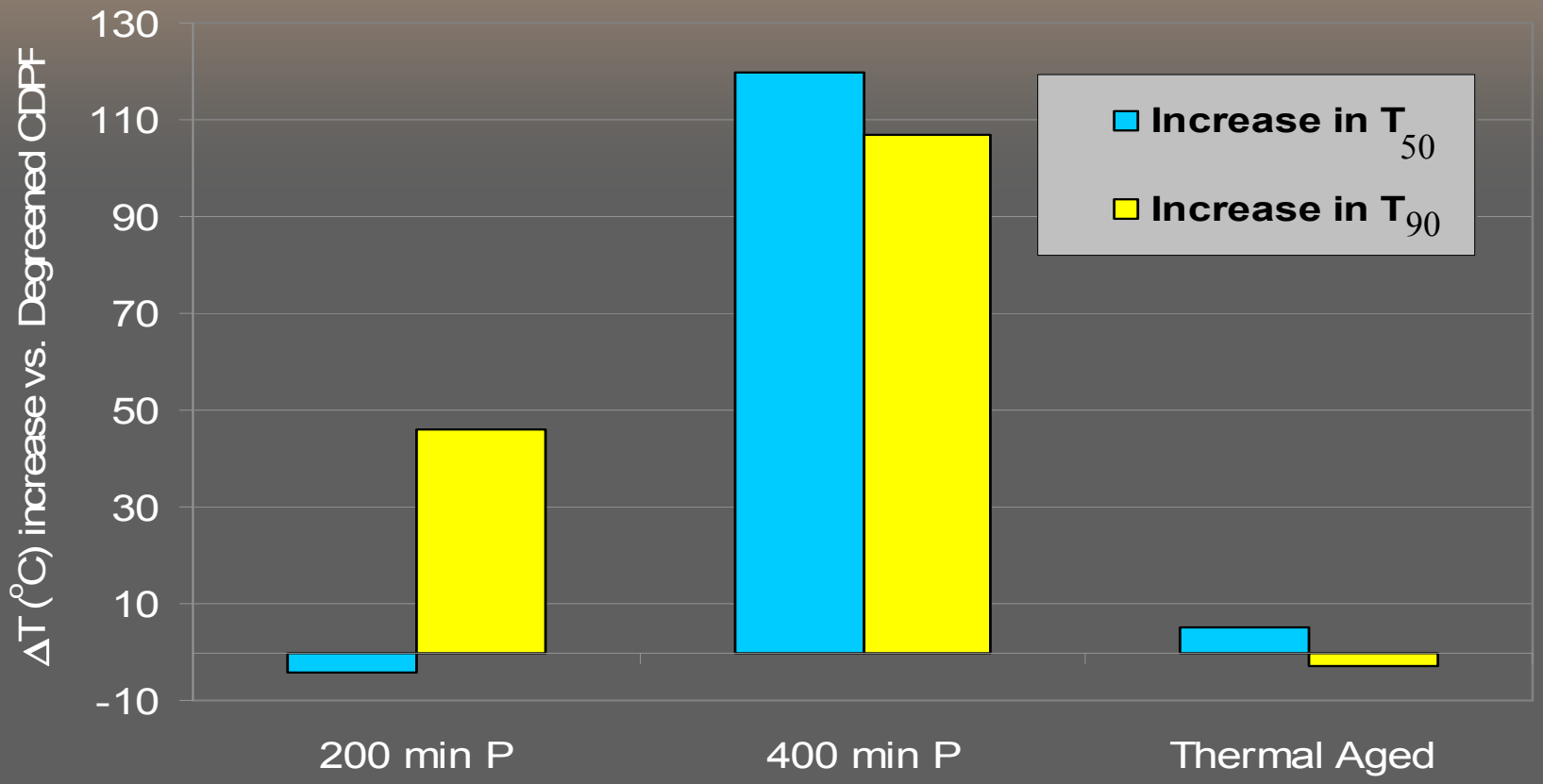
- Phosphorus aging decreases the filtration efficiency of diesel particulate filters

Soot Regeneration and Phosphorus



- Phosphorus (P) aging has a drastic effect on the soot regeneration
- 200 min of accelerated P-aging causes higher soot-regeneration temperatures
- 400 min of accelerated P-aging completely kills the catalyst effect on soot regeneration

Soot Conversion on Aged Filters



- Phosphorus (P) impacts soot regeneration temperature profile more than thermal aging
- Effect of P increases with concentration until it completely kills the catalyst effect

Conclusions

- Exposure to phosphorus simulates continuous combusted oil leak for 600K, 1200K miles
- Thermal and phosphorus aging had minor effect on ΔP
- Thermal aging improved initial filtration efficiency
- Phosphorus exposure decreased filtration efficiency
- Thermal aging had minor effect on soot regeneration
- P-exposure significantly decreased catalyst activity on filters

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