Durability of Diesel Particulate Filters – Bench Studies on Cordierite Filters

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**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% O₂
- 6% water
- SV = 30K / h
- Ramp to 650°C @ 2.5°C / min
Phosphorus (P) source: 1% (TCP) Tri-Cresyl Phosphate [(4-CH₃C₆H₄O)₃PO]

<table>
<thead>
<tr>
<th>Bench Exposure Time</th>
<th>Amount of P</th>
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<tbody>
<tr>
<td>200 min</td>
<td>8 (g / L)</td>
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<tr>
<td>400 min</td>
<td>16 (g / L)</td>
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- Bench system for accelerated phosphorus aging
- It simulates phosphorus deactivation due to combusted oil
Thermal aging of 200 hours has only a minor impact on pressure drop
Chemical aging by phosphorus has only a minor impact on pressure drop.
Thermal aging of 200 hours has a minor impact on filtration efficiency.
Phosphorus aging decreases the filtration efficiency of diesel particulate filters.
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.
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 $\Delta P$
- 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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