

Automatic Transmission Fluid VII Effects in Taxi Cab Severe Field Service

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Encontro com o Mercado 2019



Agenda

- Project Background
- Project Plan
- Taxi Vehicle Fleet
- Test Oils
- 100K Teardown Ratings and Analysis
- Used Fluid Analysis
- Summary



Project Background

1

Durability Study

Demonstrate durability and no harm



2

100,000 Miles

Validate durability over vehicle lifetime
100,000 miles (24 months)



3

Teardown

Transmission Teardown
Evaluation by independent raters

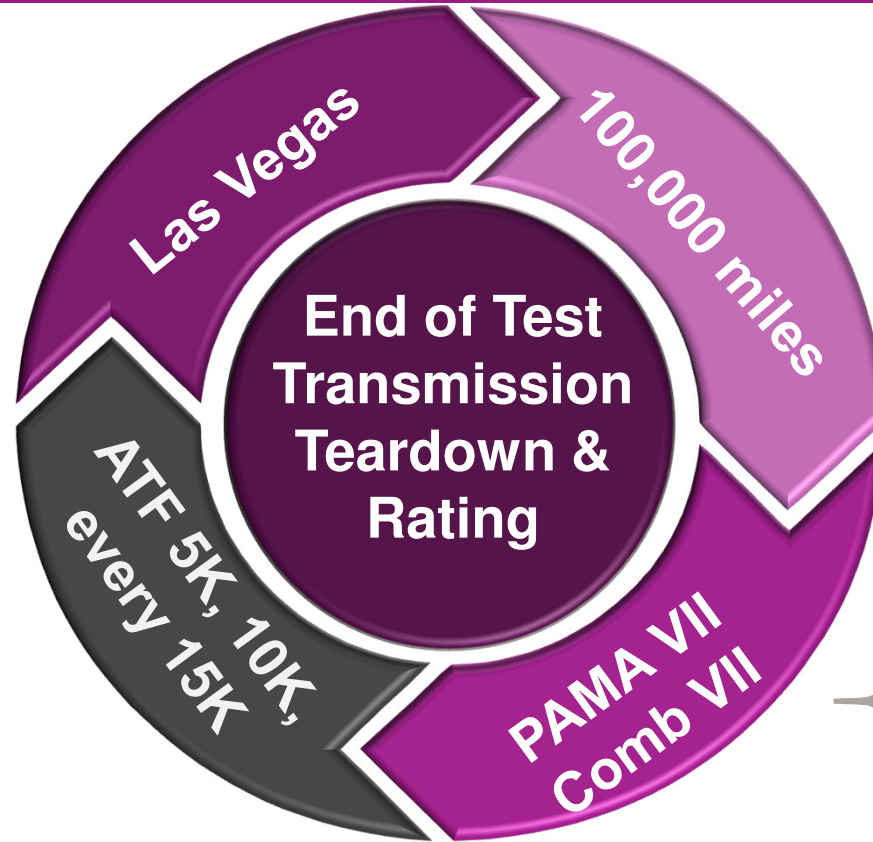
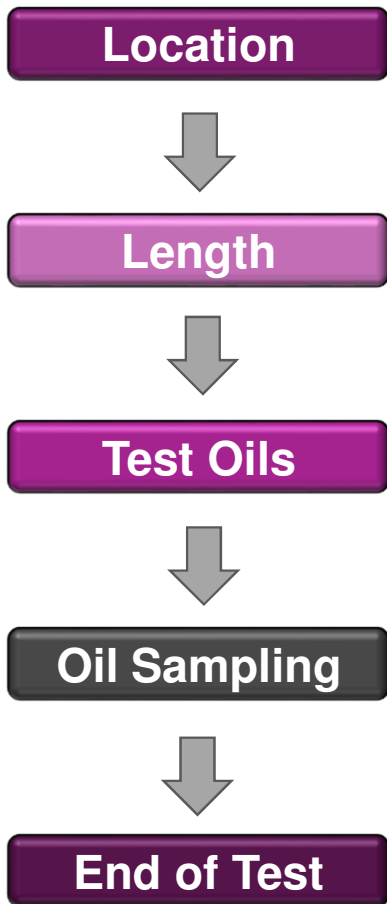


4


Outside Scope

- Foreign Vehicles
- Manual Configurations
- CVT Configurations


Project Plan



PAMA VII:
Polyalkymethacrylate



Comb VII:
Oil insoluble PAMA
Oil soluble long chain based on polybutadiene



Taxi Vehicle Fleet

- ❑ Nine 2017 Ford Taurus
- ❑ 2.0 L EcoBoost® engines
- ❑ Six-speed SelectShift® automatic transmissions
- ❑ Mercon® LV performance ATF fluid

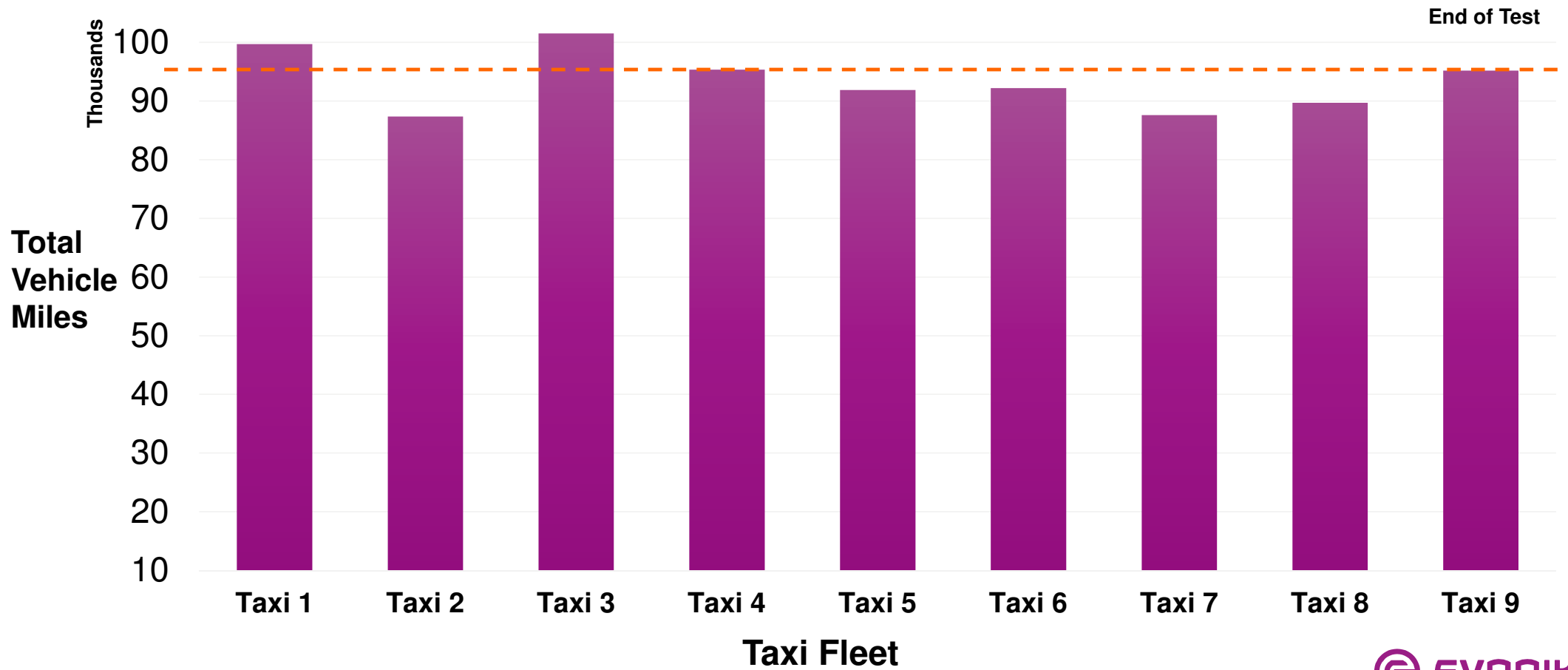


Field Test Oil Matrix

Test Oil	Description	Base Oil	ATF Performance
1	Comb VII	Gr. III	Mercon® LV
2	Comb VII	Gr. III	Mercon® LV
3	Comb VII	Gr. III	Mercon® LV
4	Comb VII	Gr. III	Mercon® LV
5	Comb VII	Gr. III	Mercon® LV
6	Comb VII	Gr. III	Mercon® LV
7	PAMA VII	Gr. III	Mercon® LV
8	PAMA VII	Gr. III	Mercon® LV
9	PAMA VII	Gr. III	Mercon® LV



Current Vehicle Mileage



Current Vehicle Mileage



Teardown Ratings & Analysis



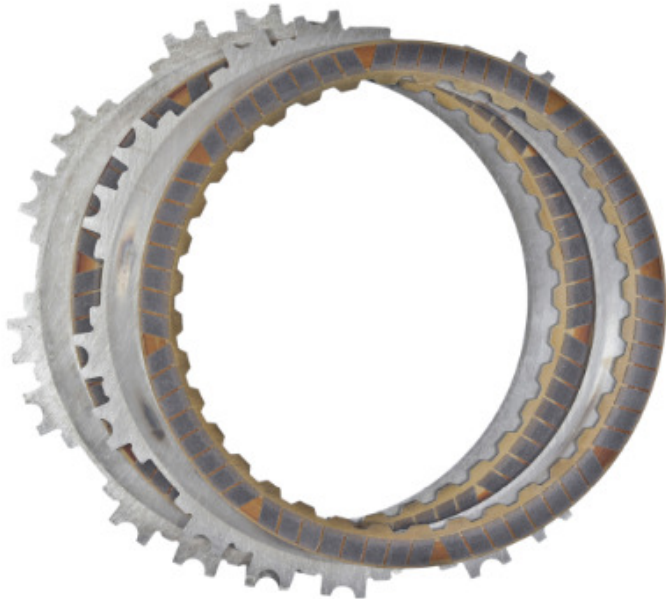
Transmission Teardown Ratings & Analysis – 1-2-3-4 Clutch Plates (Fiber)

Discoloration	Medium
Deterioration/Wear	Trace
Sludge Rating	9.75

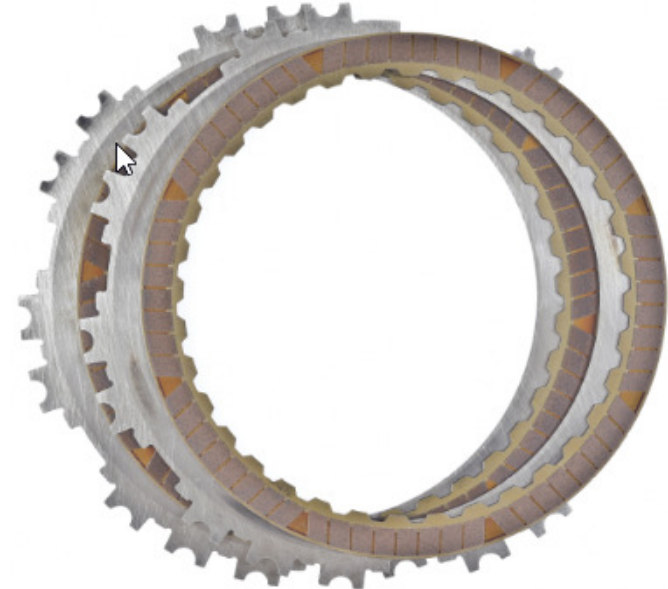


Discoloration	Medium
Deterioration/Wear	Trace
Sludge Rating	9.50

**VII A
Comb**



**VII B
PAMA**



Transmission Teardown Ratings & Analysis – Pump Body

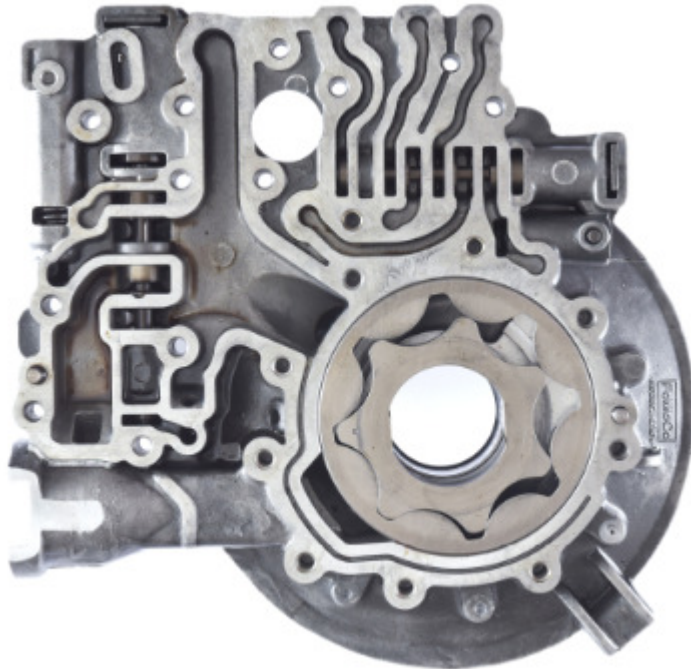
Discoloration	Trace
Deterioration/Wear	Light
Sludge Rating	9.75



Discoloration	Trace
Deterioration/Wear	Trace
Sludge Rating	9.75



VII A
Comb



VII B
PAMA

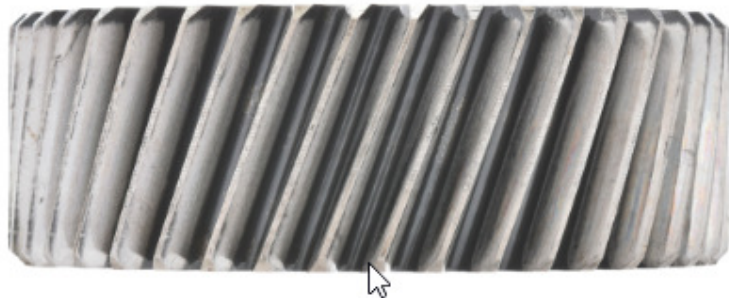


Transmission Teardown Ratings & Analysis – Input Planetary Sun Gear

Discoloration	Trace
Deterioration/Wear	Light
Sludge Rating	9.75

Discoloration	Trace
Deterioration/Wear	Light
Sludge Rating	9.75

VII A
Comb



VII B
PAMA



Transmission Teardown Ratings & Analysis – Final Drive Sun Gear

Discoloration	Trace
Deterioration/Wear	Trace
Sludge Rating	9.75



VII A
Comb



Discoloration	Trace
Deterioration/Wear	Trace/Light
Sludge Rating	9.50

VII B
PAMA



Transmission Teardown Ratings & Analysis – Ring Gear

Discoloration	Trace
Deterioration/Wear	Trace
Sludge Rating	9.75

VII A
Comb



Discoloration	Trace
Deterioration/Wear	Trace/Light
Sludge Rating	9.50

VII B
PAMA



Transmission Teardown Ratings & Analysis – Fluid Pan

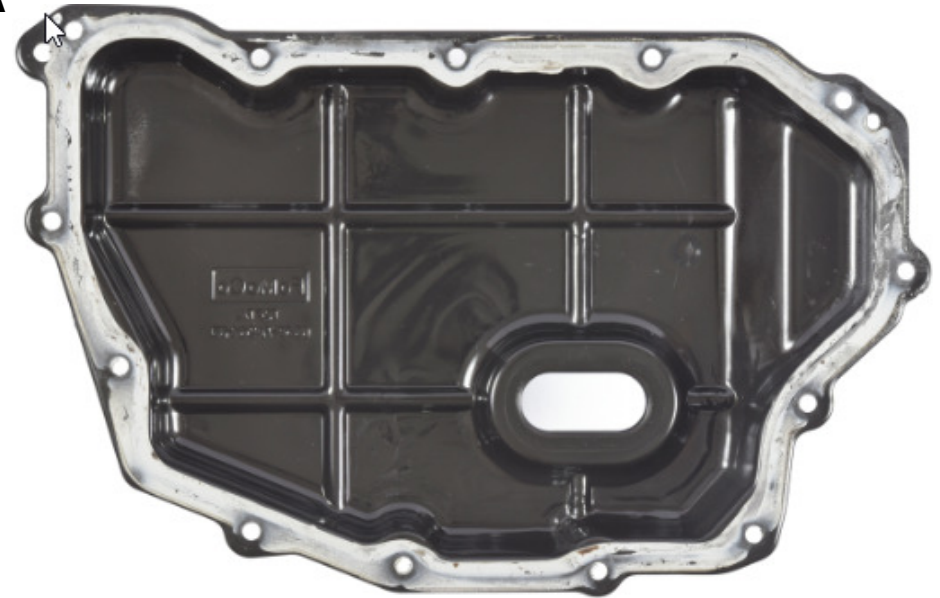
Condition	Good
Sludge Rating	9.0

VII A
Comb



Condition	Good
Sludge Rating	9.75

VII B
PAMA

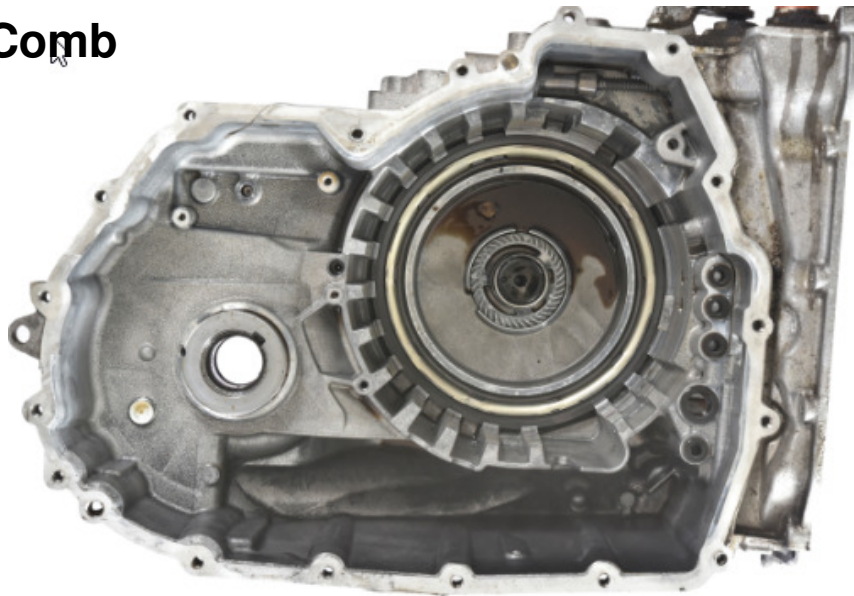


Transmission Teardown Ratings & Analysis – Housing

Discoloration	Trace
Deterioration/Wear	Light
Sludge Rating	9.25



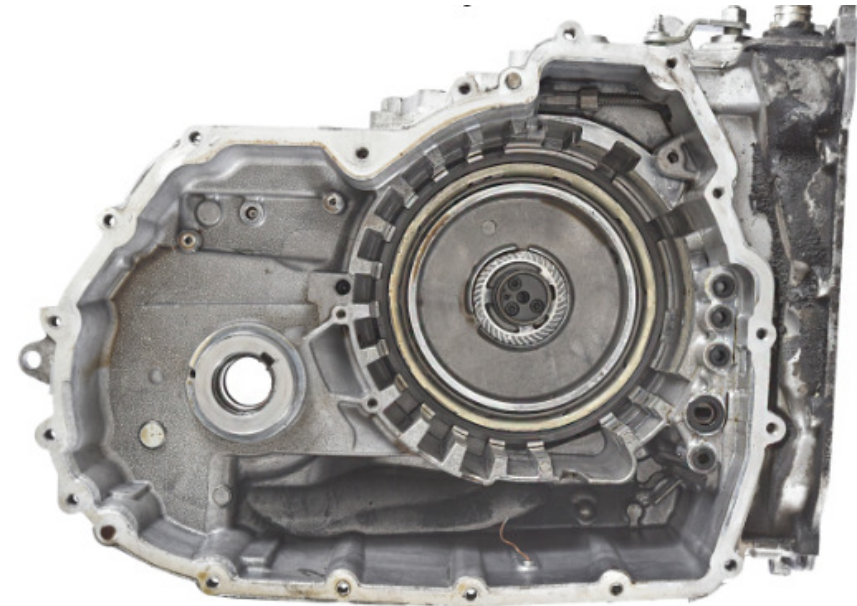
VII A
Comb



Discoloration	Trace
Deterioration/Wear	Light
Sludge Rating	9.25



VII B
PAMA



Transmission Teardown Analysis Observations

Comb VII

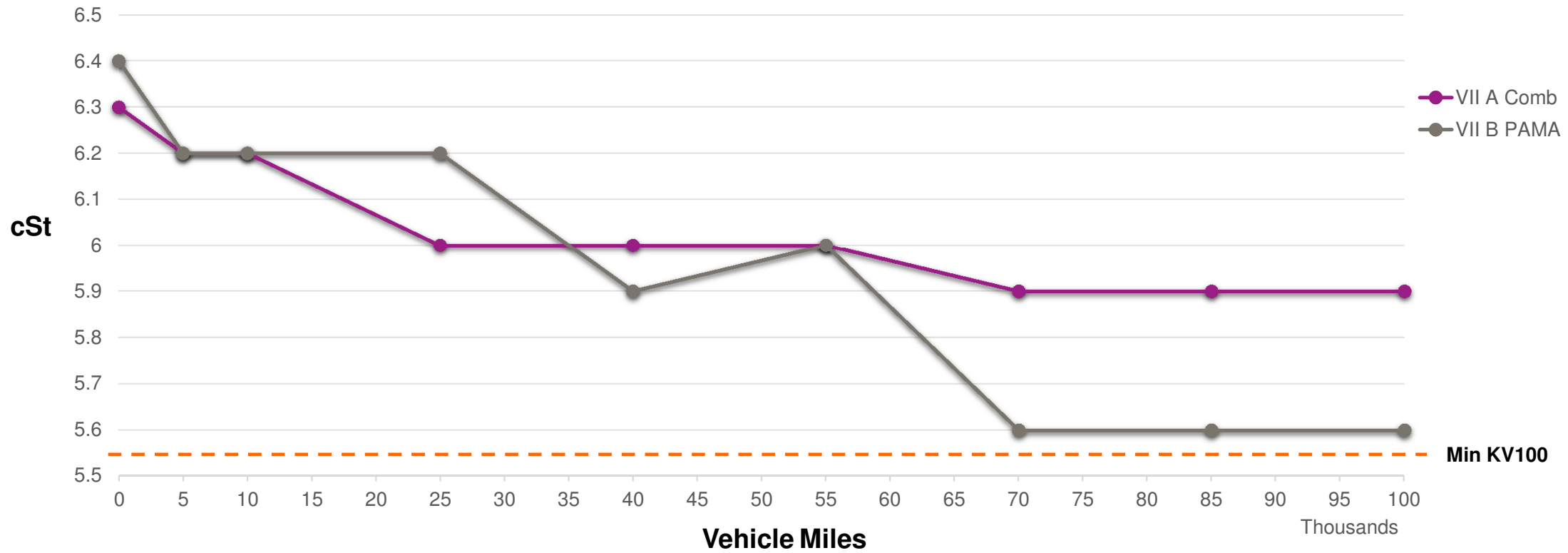


PAMA VII

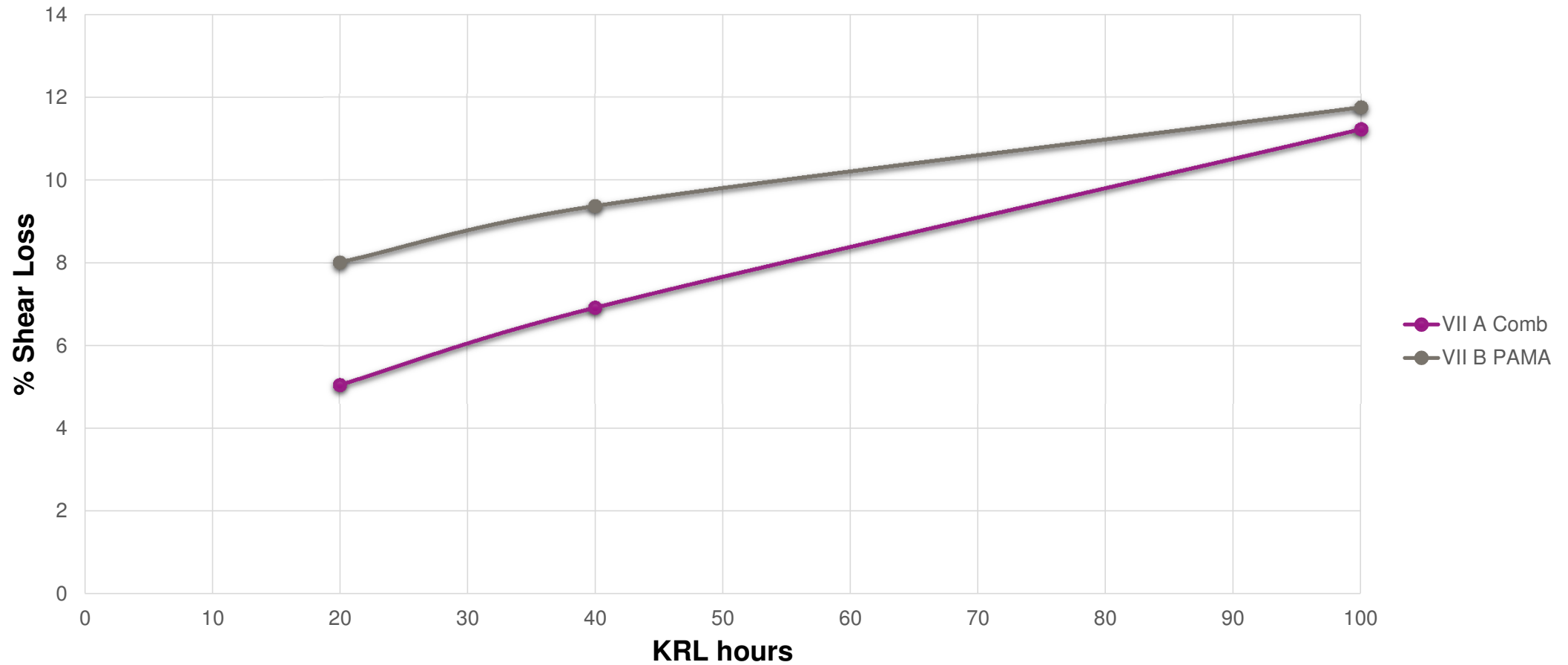


Used Transmission Fluid Analysis

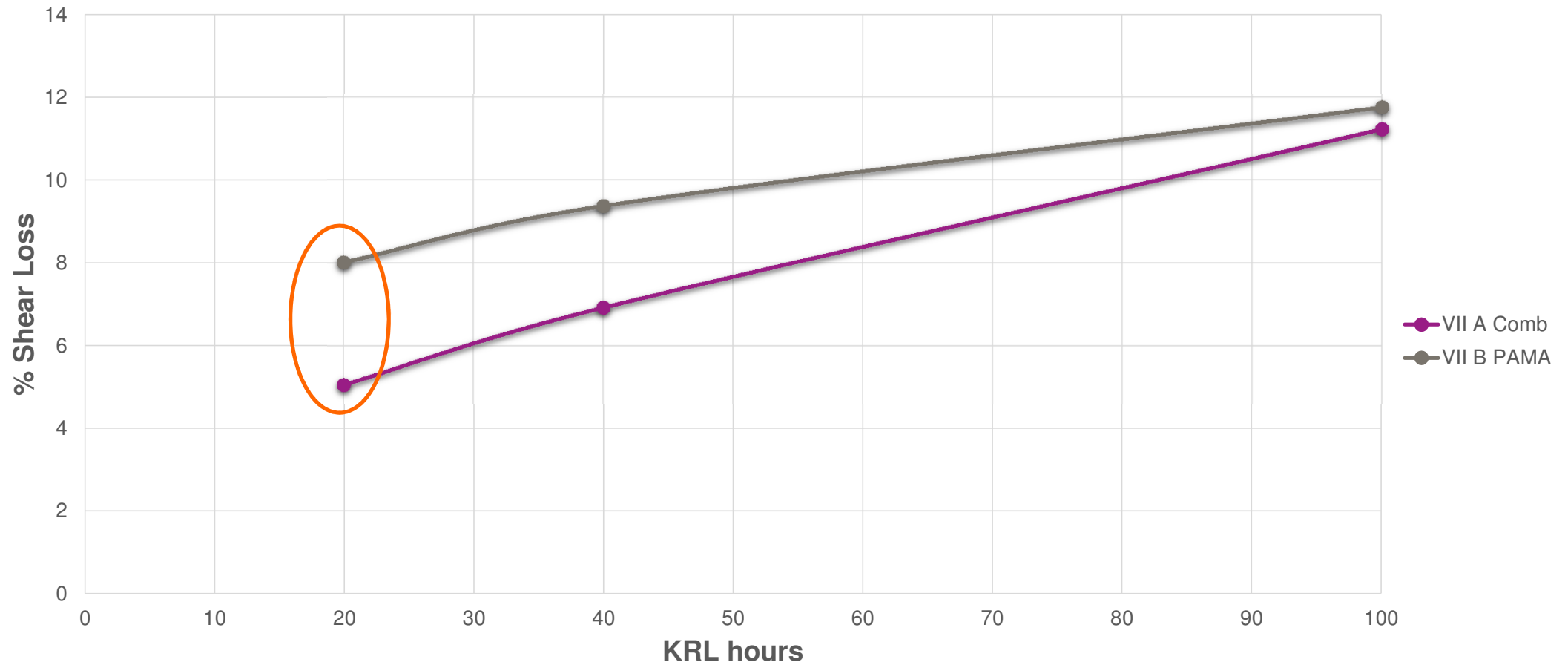
ATF Shear Stability – KV100



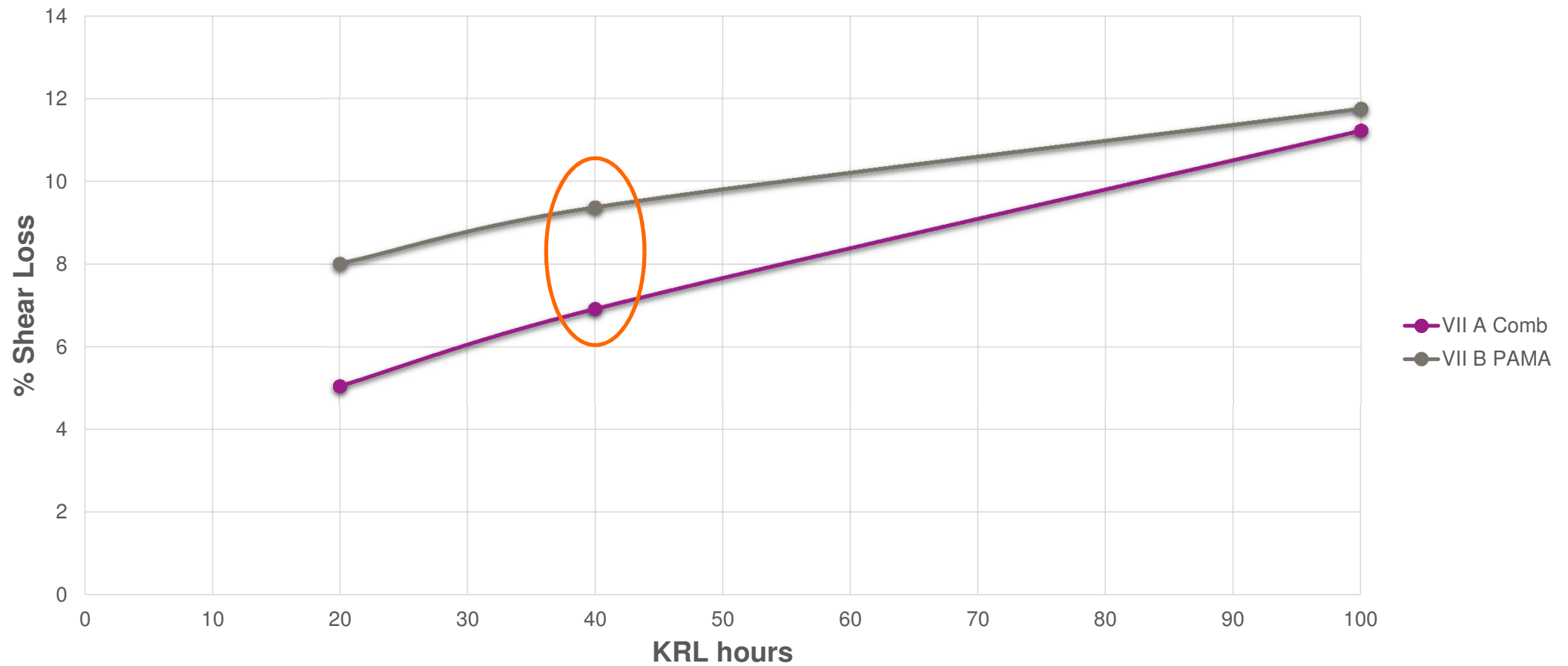
KRL Shear Loss – KV100



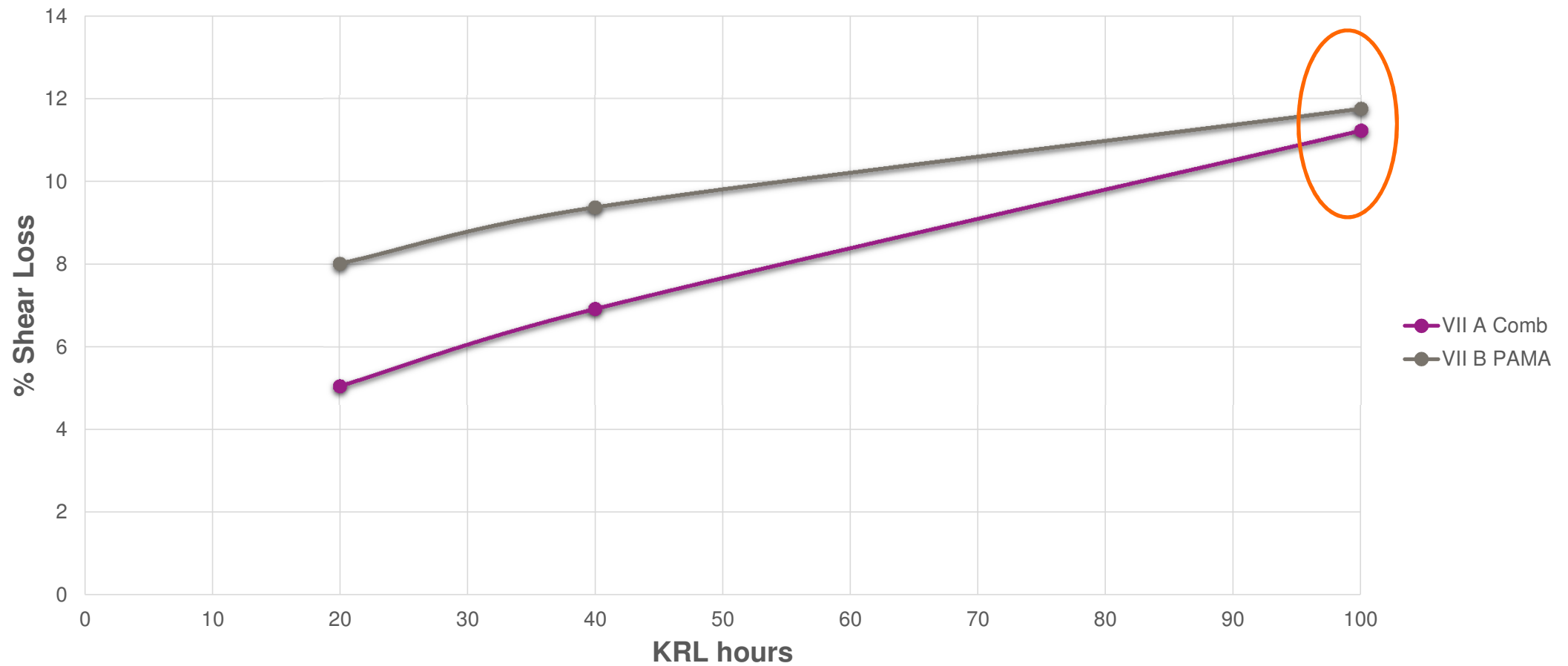
KRL Shear Loss – KV100



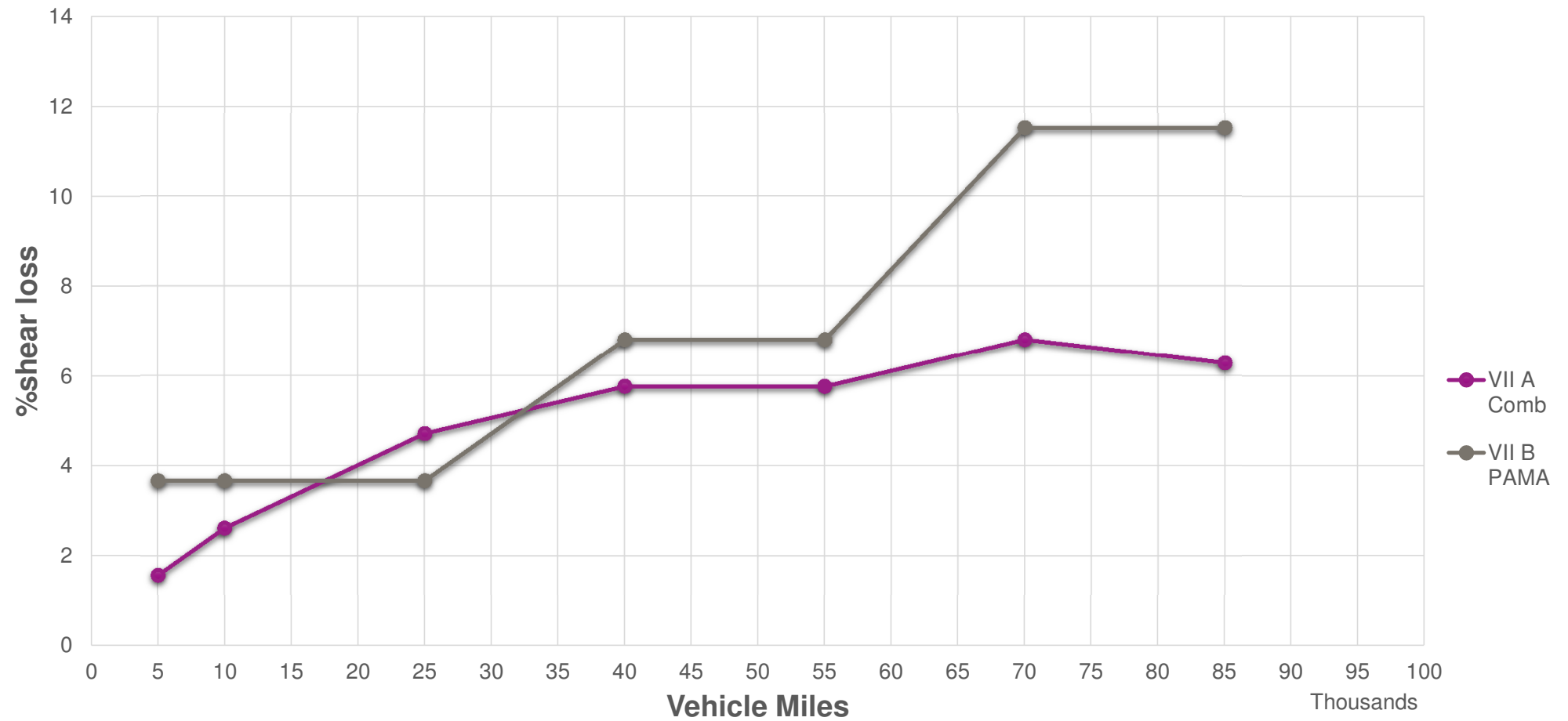
KRL Shear Loss – KV100



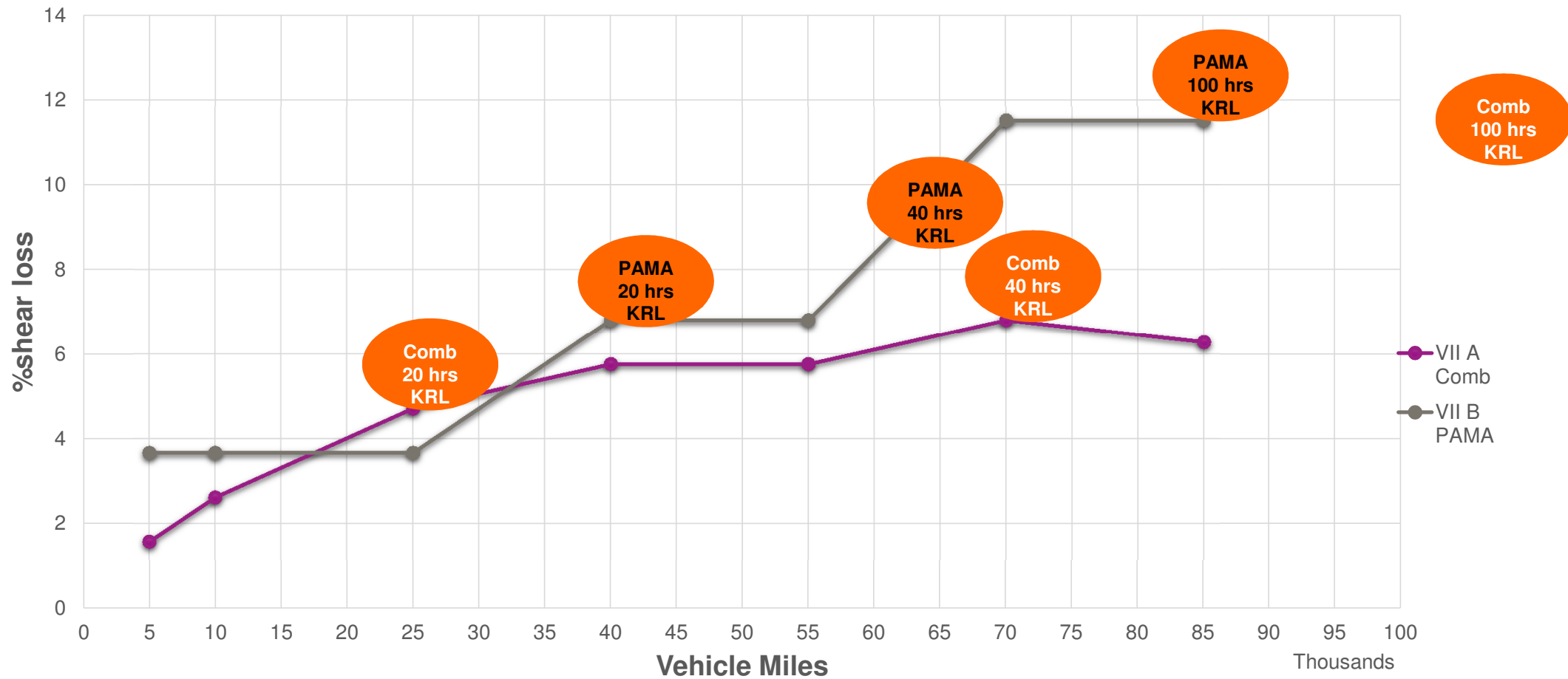
KRL Shear Loss – KV100



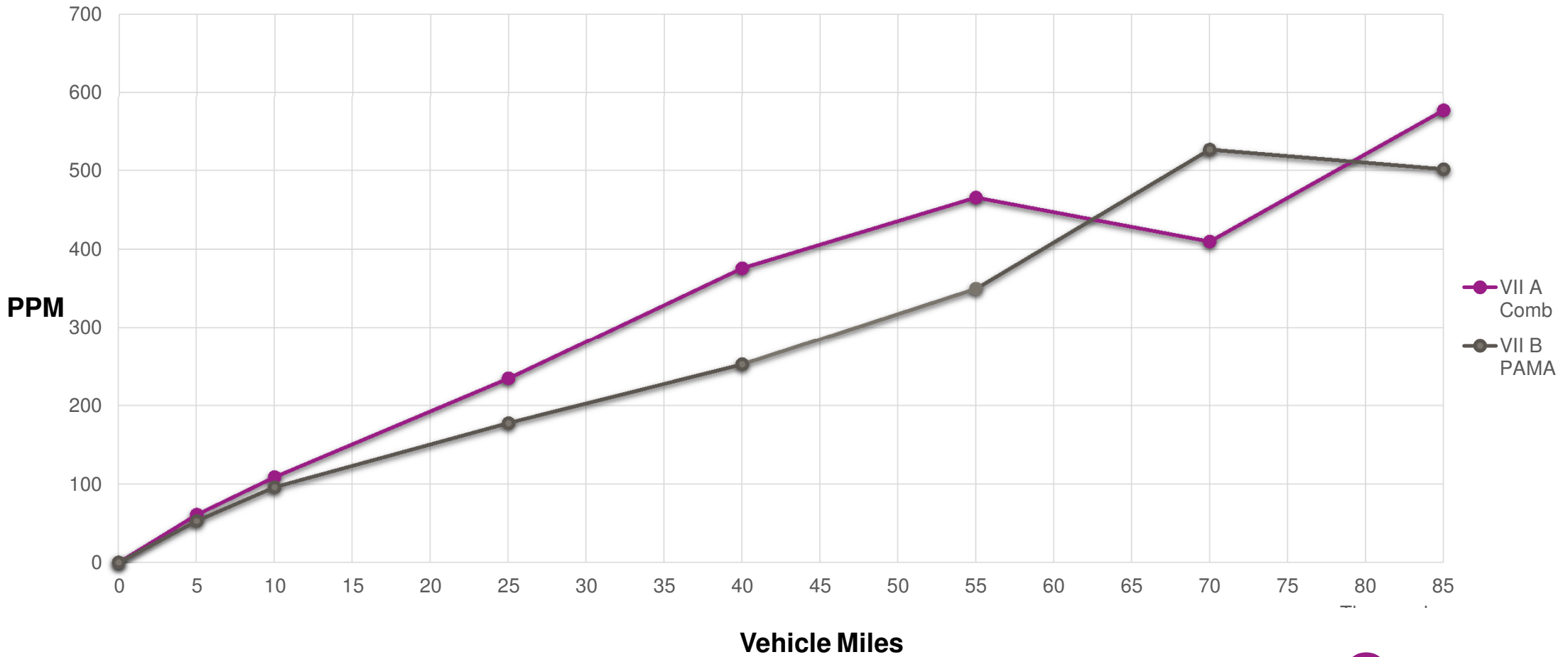
Vehicle Shear Loss



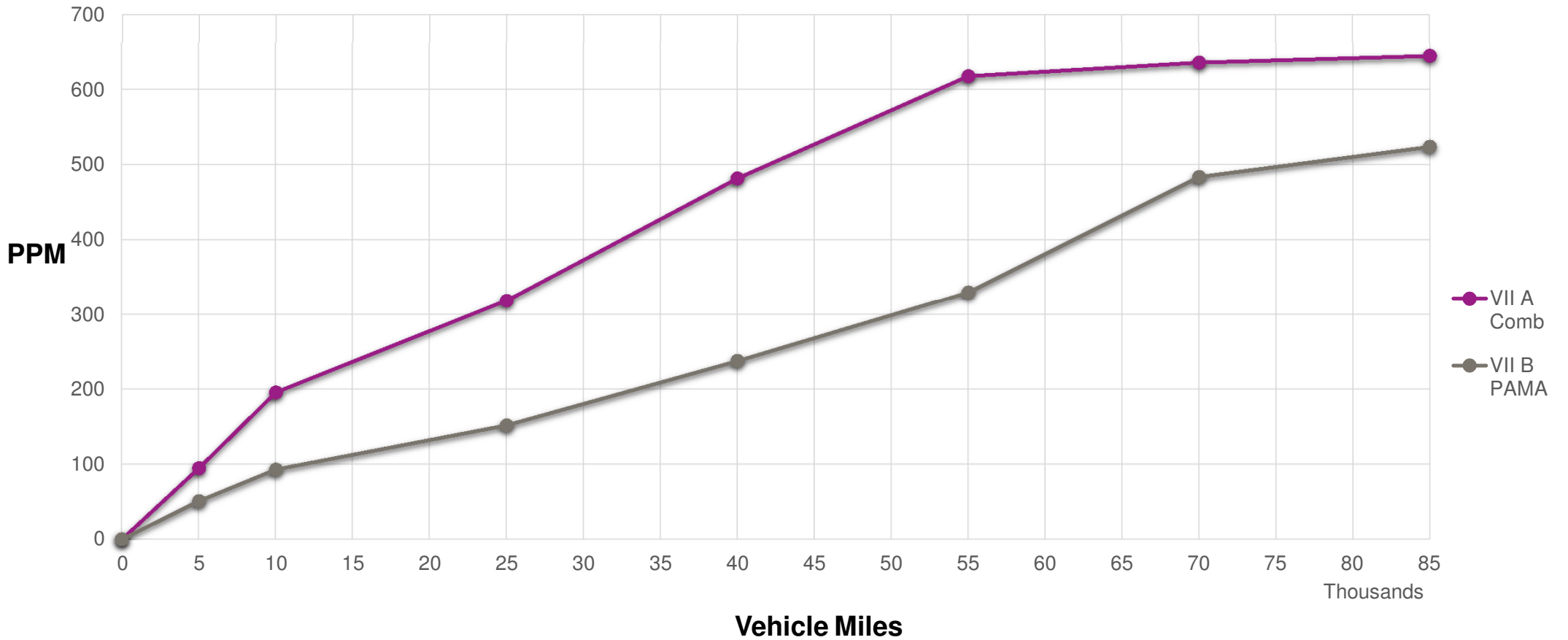
Correlation of Shear Loss – KRL and Field



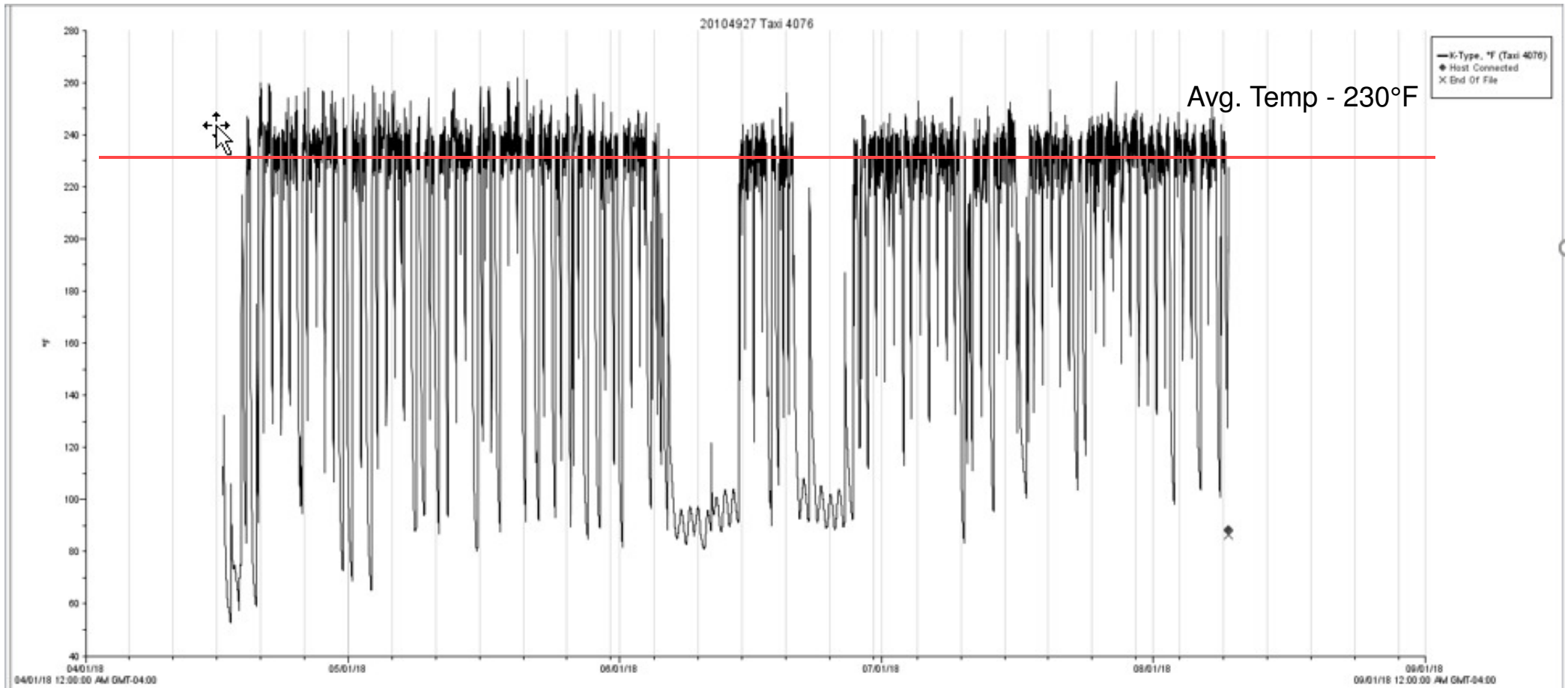
ATF ICP – Iron (Wear Metal)



ATF ICP – Aluminum (Wear Metal)

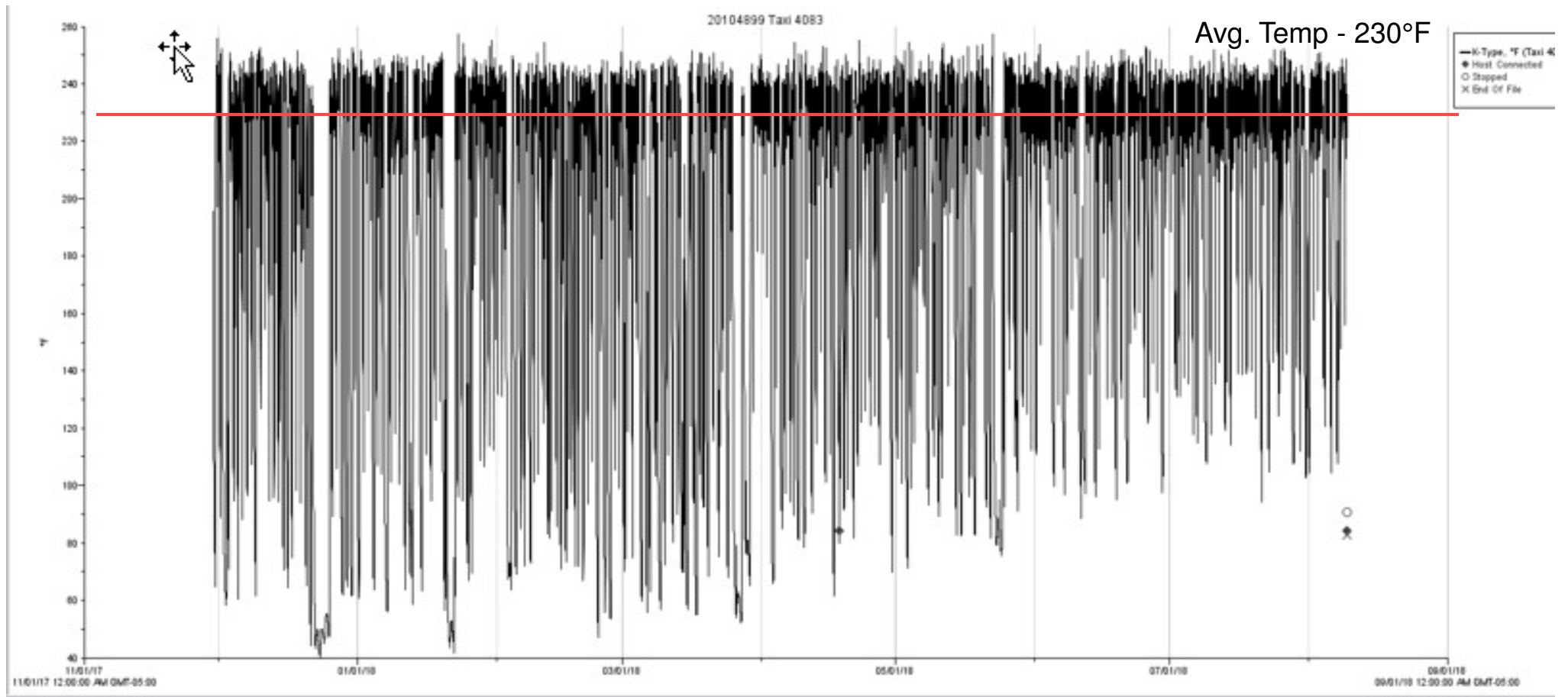


ATF Temperature Profile – Comb VII A



ATF temperatures are consistently around 230°F indicating the ATF DI package remains effective.

ATF Temperature Profile – PAMA VII B



ATF temperatures are consistently around 230°F indicating the formulation is maintaining performance.

SUMMARY

Flexibility in formulation strategy to achieve shear stability requirements



Comb and PAMA VIIs provide high level of protection

- Stay-In-Grade
- **Shear Stability**



Cleanliness Protection

observed in both VIIs

- Sludge protection
- Wear protection



Viscosity Retention apparent in both VIIs

- Optimize viscosity profiles
- Lower viscosity fluids



Durability observed in **Comb and PAMA VIIs**

- No harm

