



AFLAS® Fluoroelastomers for HEV/EV Cable Applications



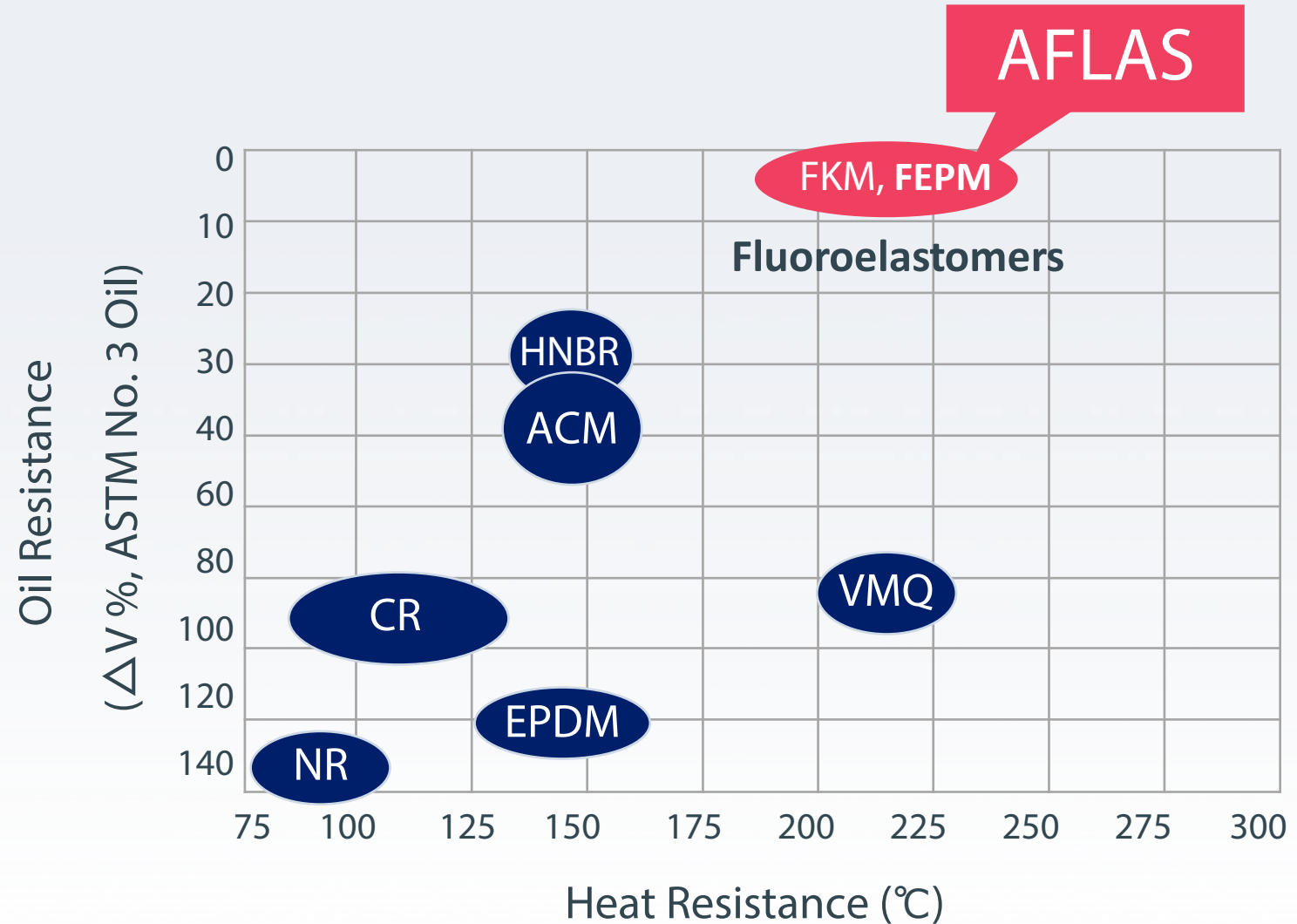
What is AFLAS®?

- AFLAS 100 and 150 Series are unique fluoroelastomers
 - Classified by ASTM D1418 as FEPM
- Totally different from other FKM type fluoroelastomers
 - Viton
 - Daiei
 - Tecnoflon
 - Etc...
- AFLAS 100 and 150 Series are formulated as Tetrafluoroethylene/Propylene copolymer (TFE/P)
- AGC is the only manufacturer of this polymer in the world

Benefits of AFLAS

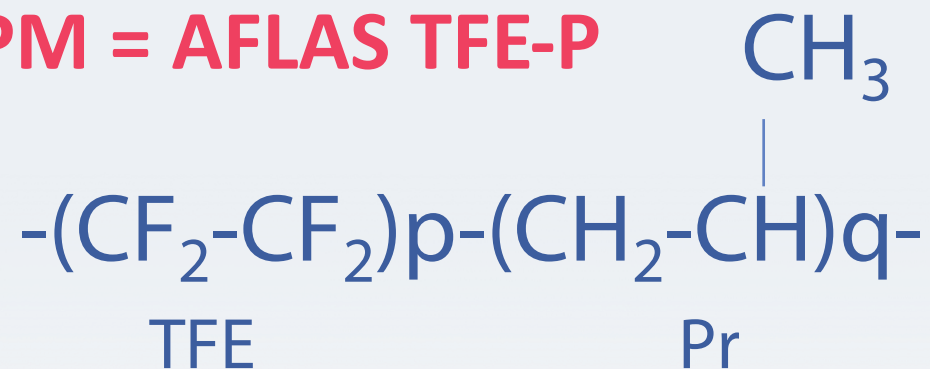
- Excellent heat resistance
 - 200°C continuous service temperature
- Superior base resistance
- Unmatched electrical resistivity compared to FKM grades
- Used today for various cable insulator applications
 - HEV / EV power cable
 - Transmission cable
 - ATF resistant

Positioning Map for Various Elastomers



Polymer Structure

FEPM = AFLAS TFE-P



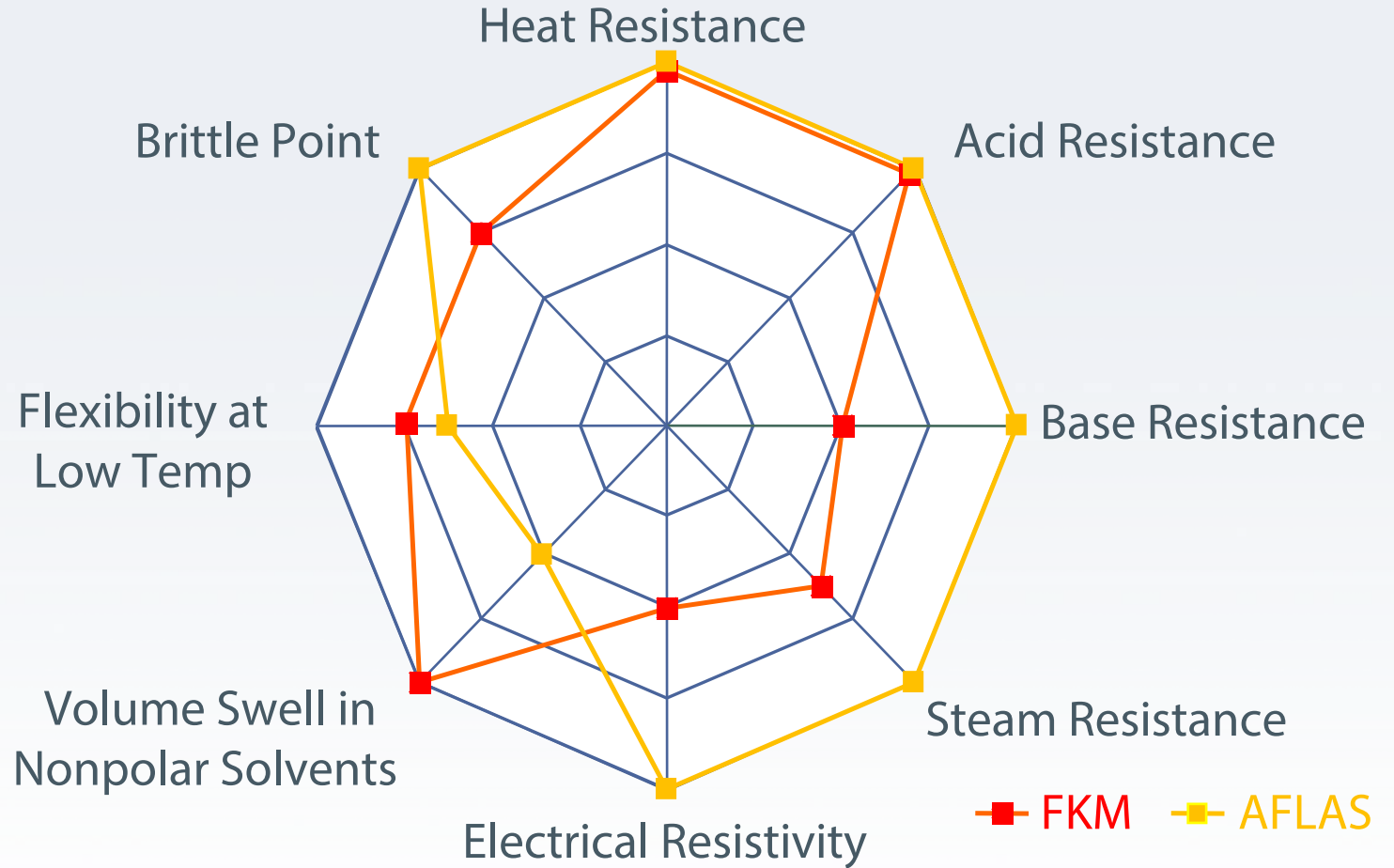
FKM = Viton, etc.



Deterioration by Base


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AFLAS Advantages Over FKM



Resistance to Automotive Fluids

Oil	Component	Application	Temperature (°C)	AFLAS®	FKM
Engine Oil		Crank Shaft Seal	160	Φ	△
AT Fluids		Transmission Seal	160	Φ	△
Gear Oil		Pinion Seal	135	Φ	X
Brake Fluids	Polyglycolether		135	○	○
Coolants	Glycol-H ₂ O	Cylinder Liner Seal	135	○	△
Operating Oils	Glycol-H ₂ O	Shock Absorber Seal	110	○	△
	Phosphate		–	○	○
	Silicone Oil		–	○	Φ
Fuels	Gasoline		110	X	Φ
	Light Oil		–	X	Φ
	Heavy Oil		–	Φ	△
	100% Methanol		–	Φ	△
Φ: Suitable ○: Applicable △: Caution X: Not Applicable					

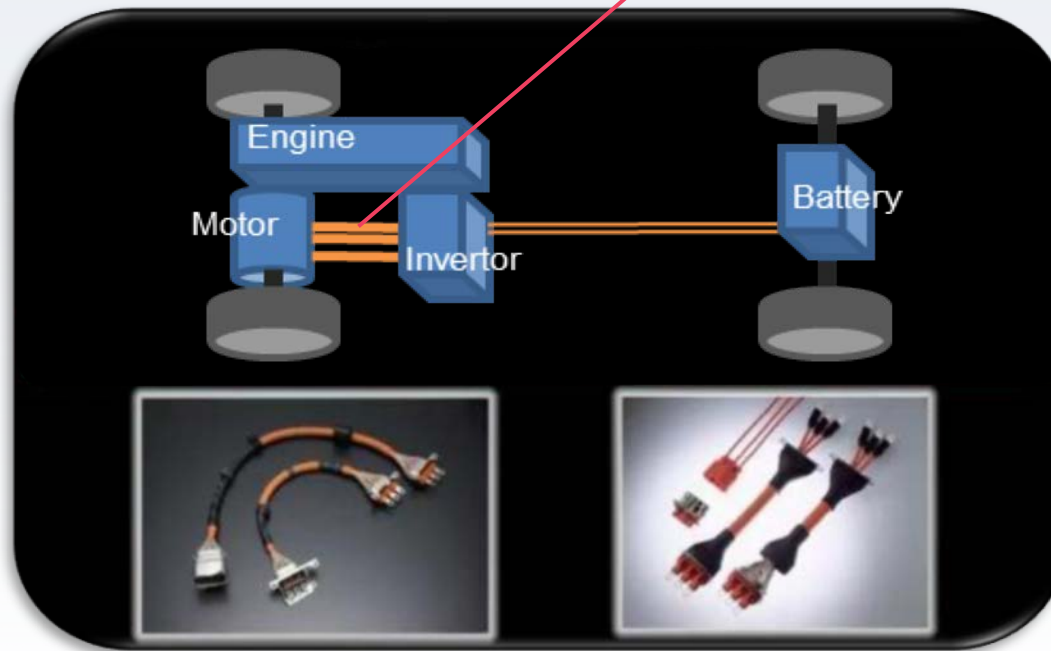


	AFLAS 150	AFLAS 200	FKM	EPDM	Silicone
Volume Resistivity ($\Omega \bullet \text{cm}$)	10^{16}	10^{15}	10^{13}	10^{16}	10^{16}
Dielectric constant (1 kHz)	3	6	10	2	4
Dielectric strength (kV/mm)	23	16	20	40	25

AFLAS has excellent electrical resistivity and heat resistance.

Weight Reduction Concept for HEV/EV Cable

Choice of High Voltage Cable

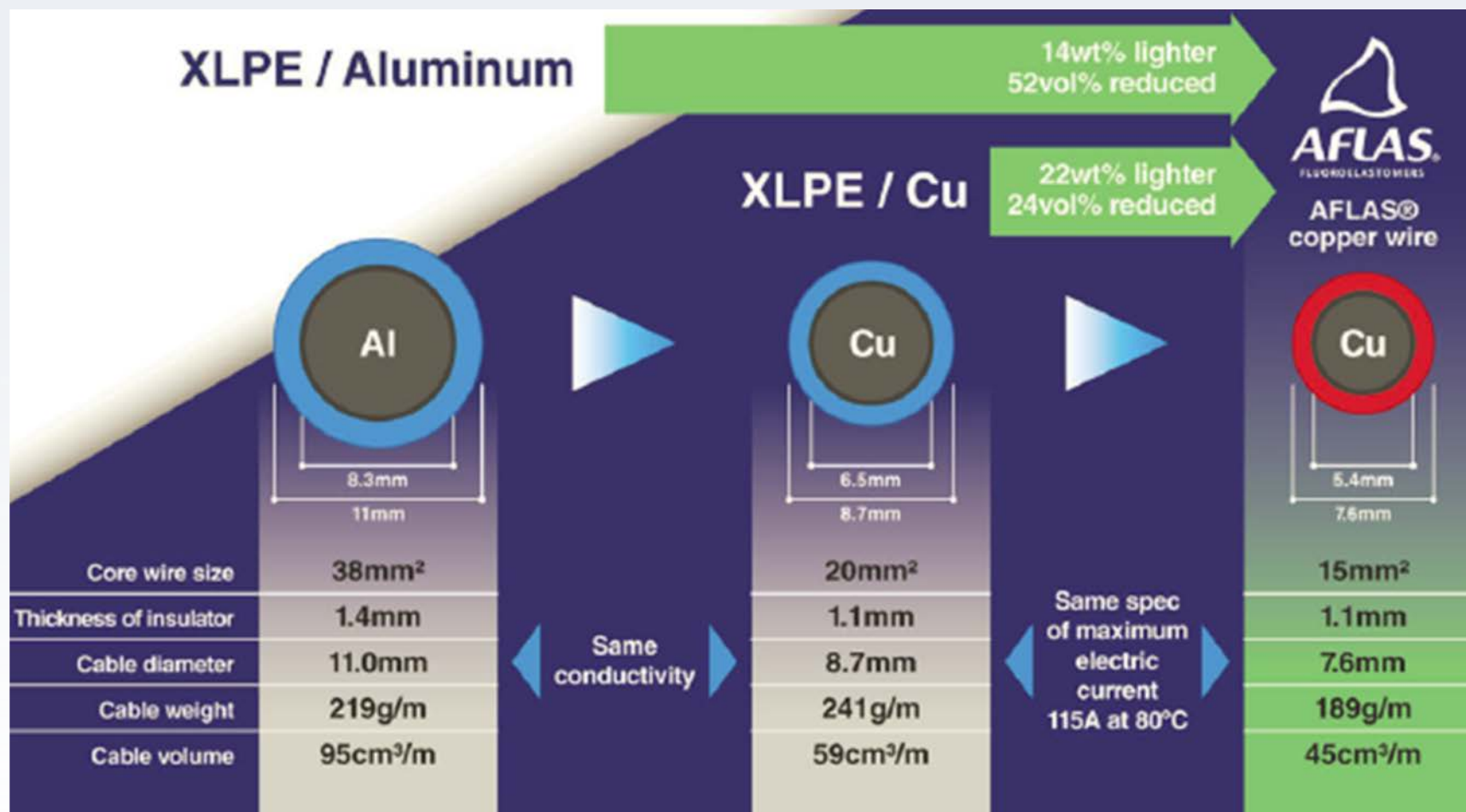


XL-PE: (150°C)

AFLAS: (200°C)



Weight Reduction Concept: Cable Comparison



AFLAS Performance Over XL-PE Cable

Advantages of AFLAS cable concept:

- Non-Flammable
- Weight Reduction
- Improved Flexibility
- Vibration Resistance
- Excellent Heat Resistance
- Superior Chemical resistance

Disadvantages of XL-PE material usage:

- Filler added (lots of $\text{Mg}(\text{OH})_2$)
- Stiff
- Limited Heat Resistance



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