Elastomer Resistance to Biofuels

Steve Jagels

Precision Polymer Engineering, Ltd.

an IDEX Company

Greenbank Rd

Blackburn, United Kingdom, BB1 3EA

Biofuels

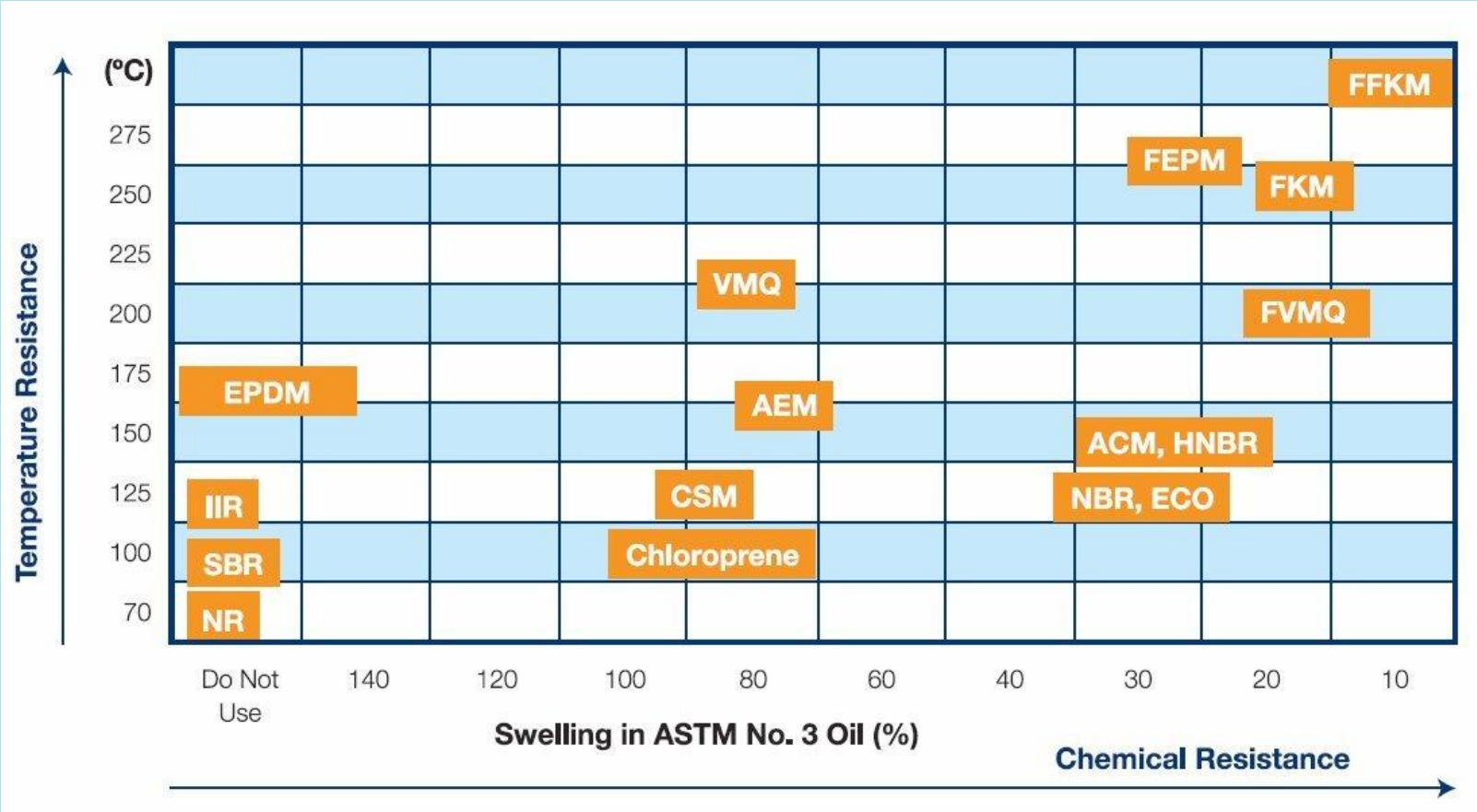
- Biodiesel
  - FAME (fatty acid methyl ester)
  - Derived from Soy, Canola, Palm Oil, etc.
  - Blends from 5% to 20% and higher.
- Ethanol
  - Fermentation of sugar and distillation
  - Corn, Sugarcane
  - Fuel blends range from 10% to 85%

Biofuel Significance for Elastomers

- Fluid Compatibility: In the broadest terms we look at the effects of swelling (volume swell)

Types of Elastomers

- NBR, HNBR, FKM most common polymers used in fuel and oil applications



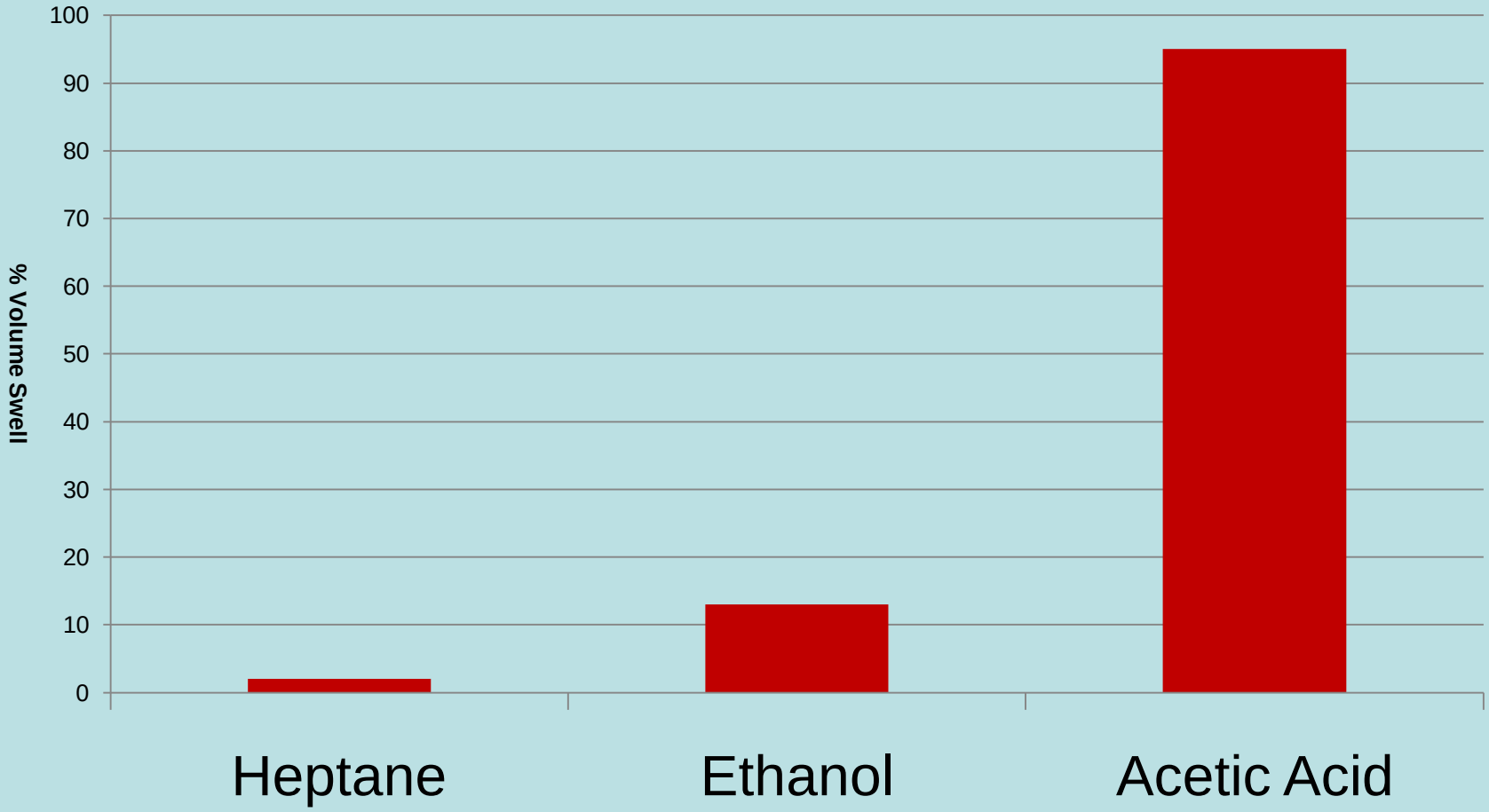
Elastomer Compounding

- Polymer Composition
- Cross Linking Chemistry
- Fillers – carbon black, mineral, polymer
- Plasticizers
- Antioxidants
- Process Aides
- …etc, 4 to 25 different ingredients

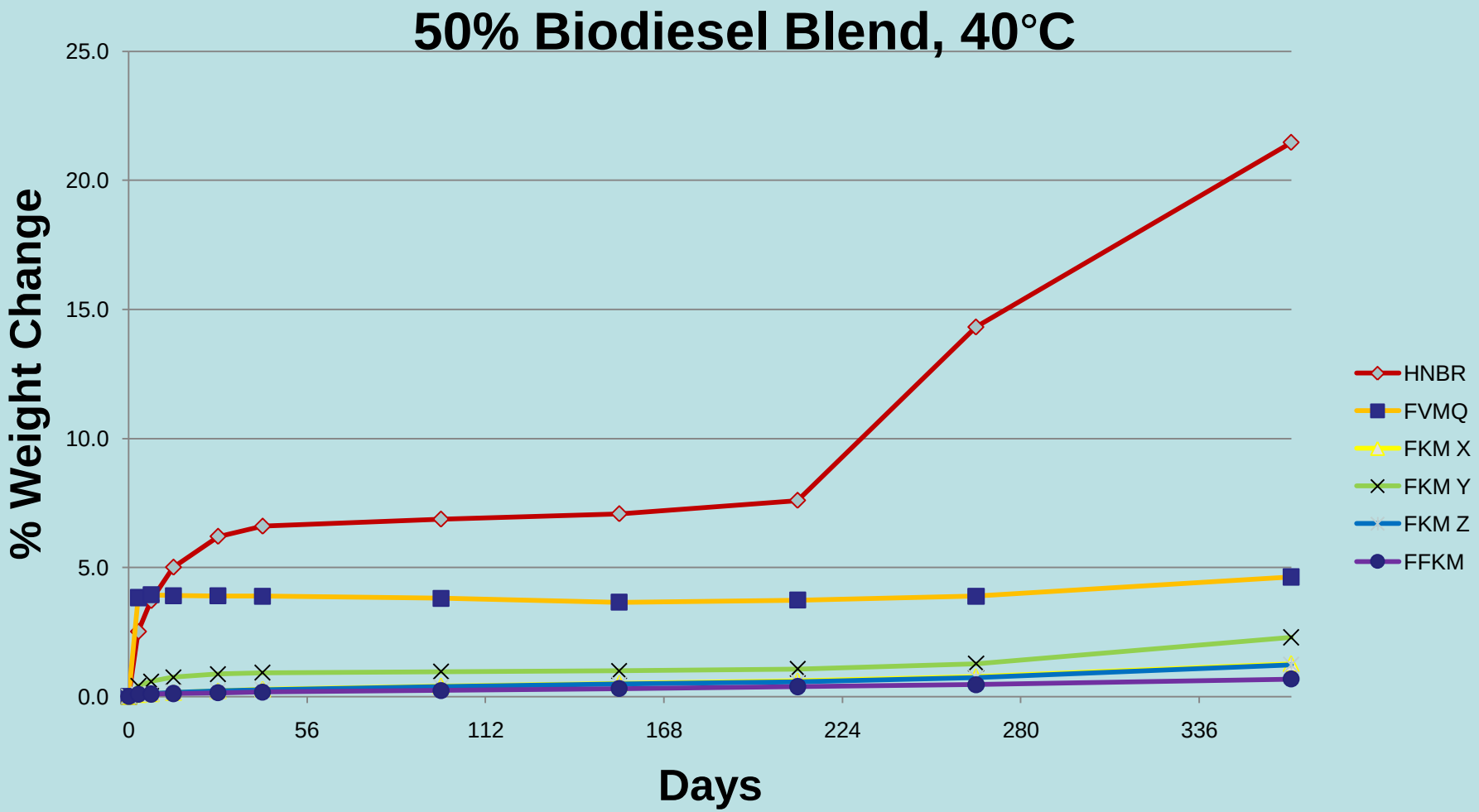
Effect of Biodiesel

- Biodiesel – Composition can change over time and increase in pH

FKM Volume Swell



Biodiesel Fluid Immersion



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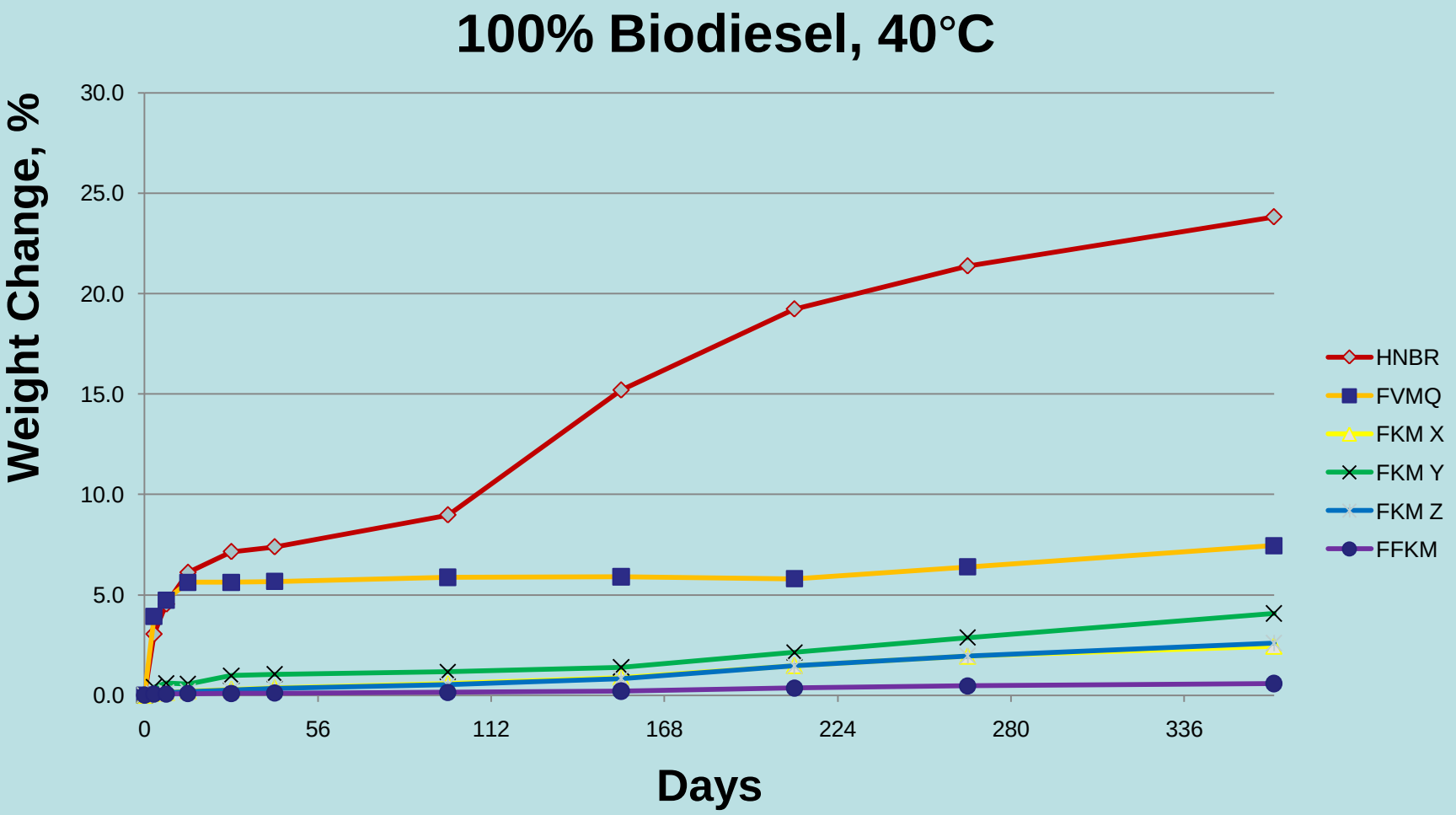

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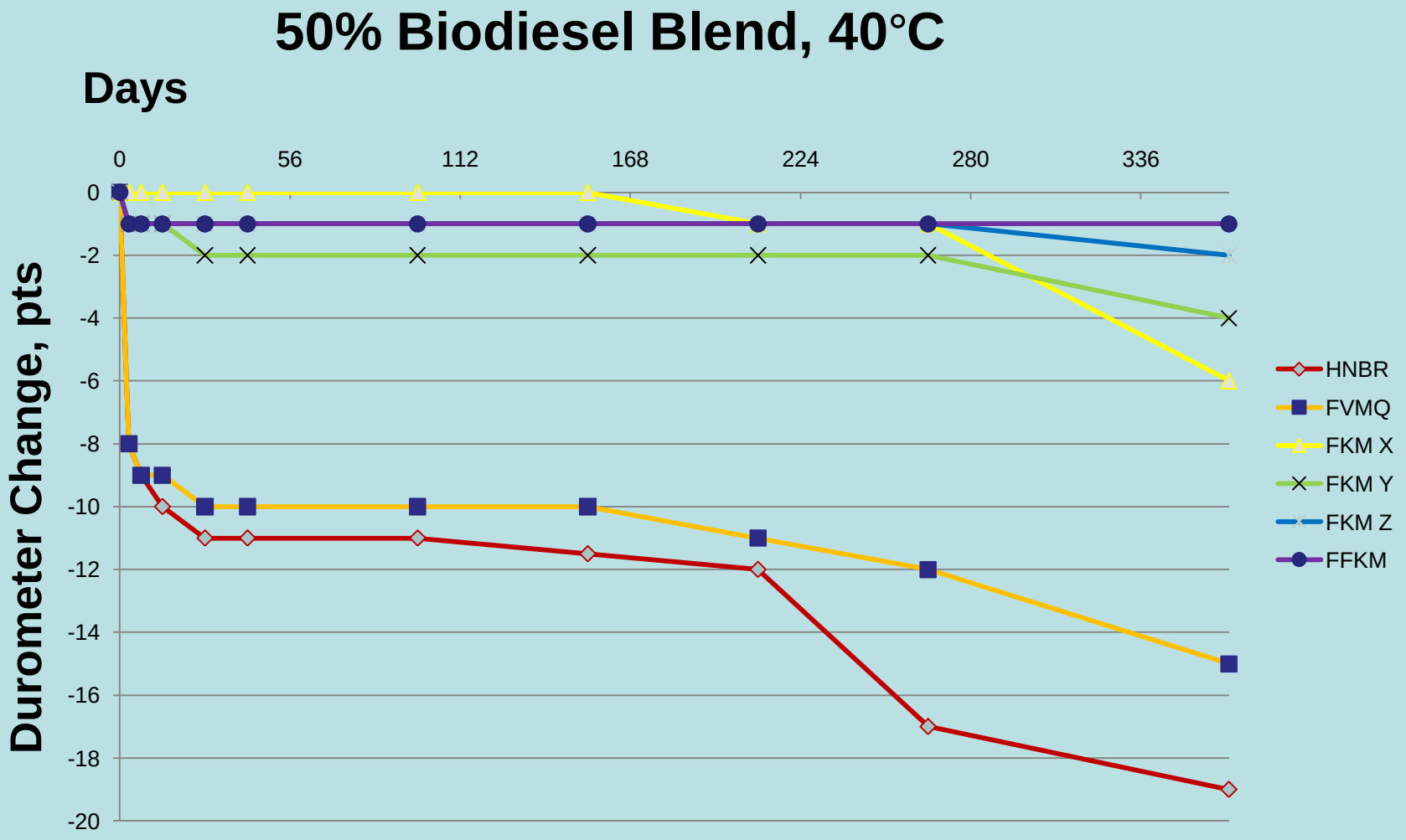

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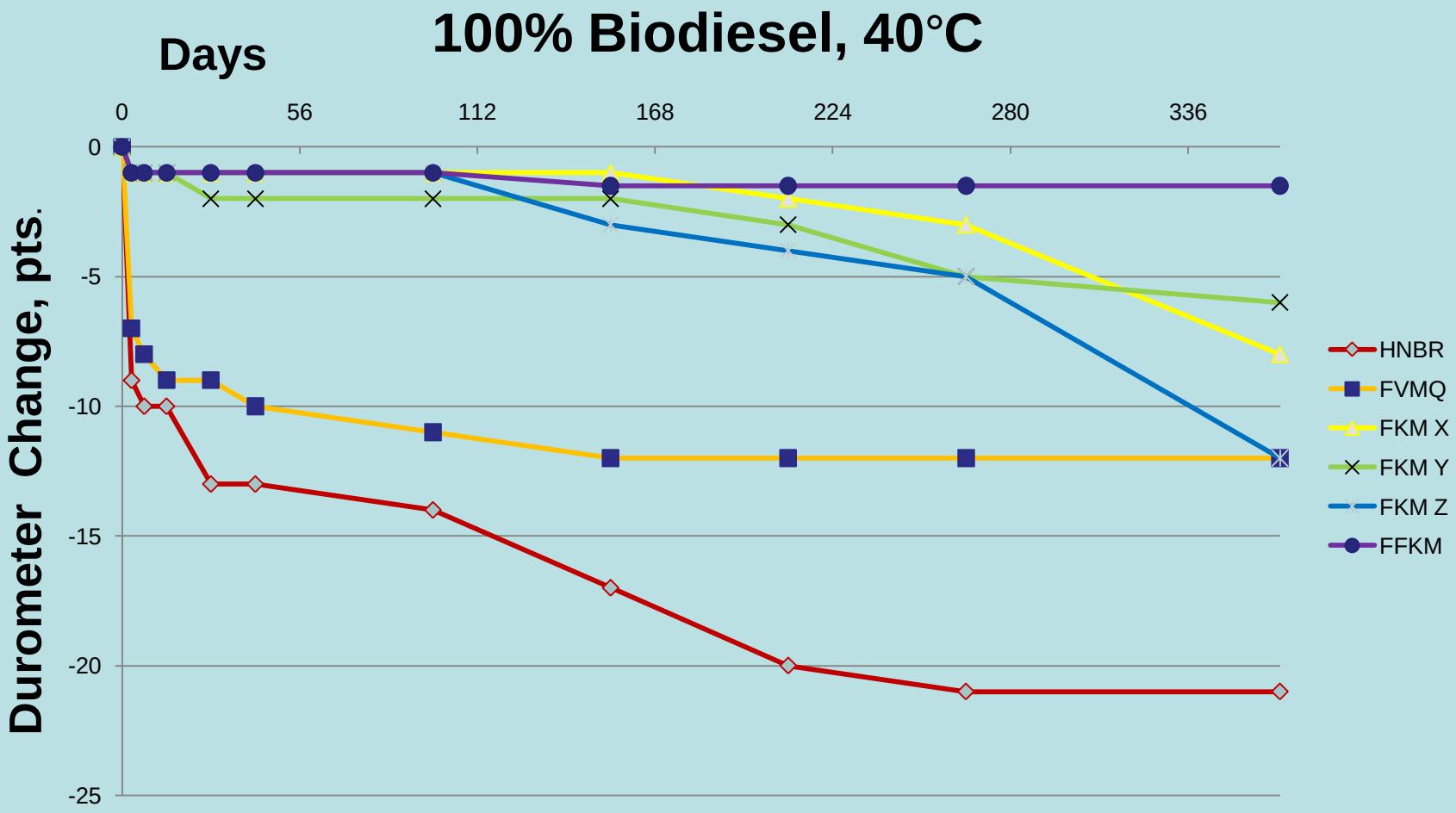
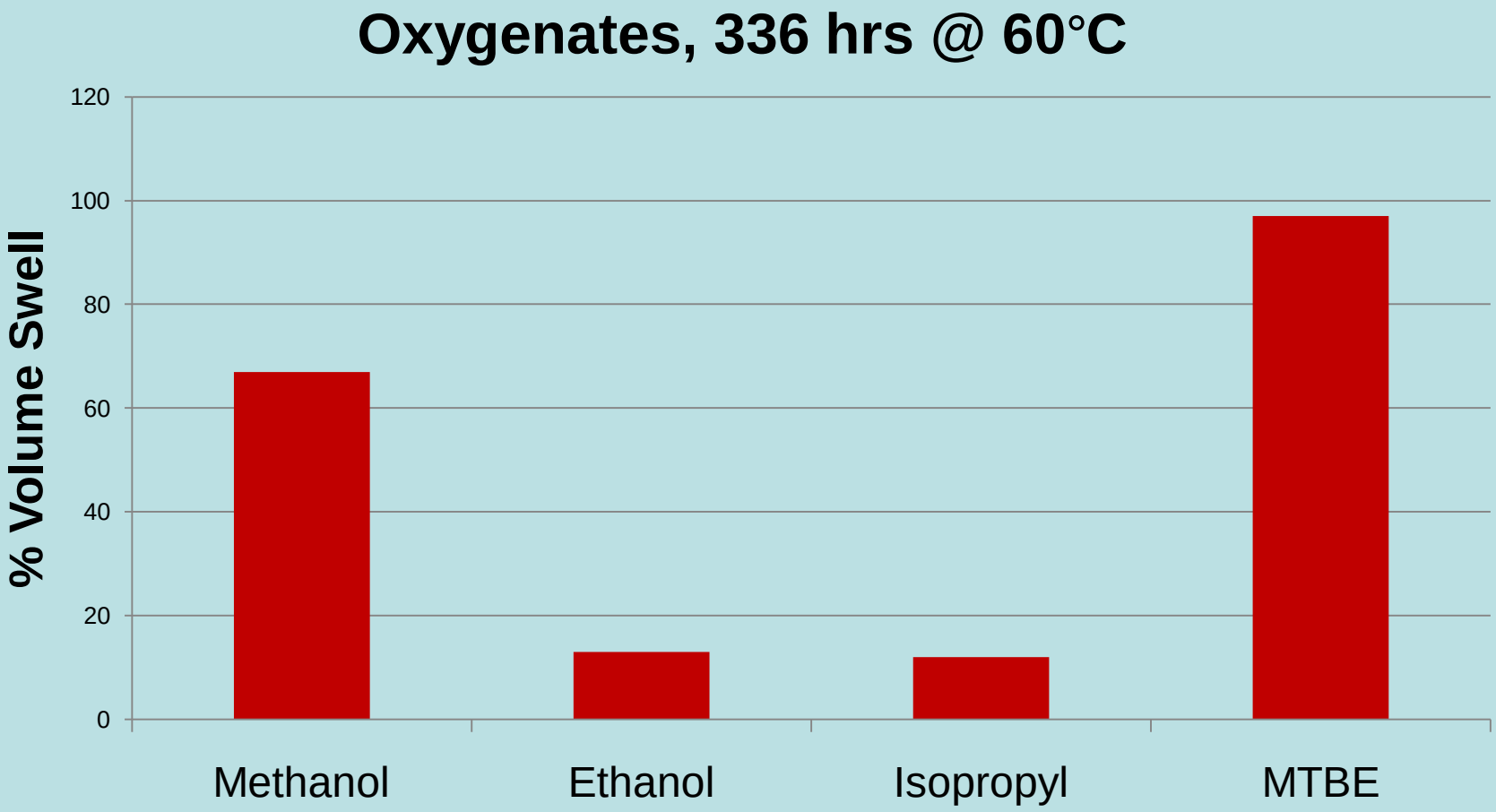


Ethanol Fuel Blends

- Neat Ethanol is easier to seal that gasoline blends (Aromatic, Aliphatic, Alcohol components)
  - Ethanol will absorb water - additional consideration for the elastomer choice
  - Ethanol readily permeate through some the elastomer types “evaporative emissions”.

FKM Volume Swell



General Maintenance Concerns

- Look for Splitting Seals from increased volume swell.
- Softening of the seal (hardness change), seal may extrude or blow out in high pressure applications
- Old fuel may change in composition over time – may lead to incompatibility and problems previously undetected

Conclusions

- Biofuels add complexity to sealing material selection
- Ask seal provider for **long-term** compatibility test results
- Elastomers should be specified by manufacturers compound…generic terms such as NBR, HNBR, FKM, are not enough.

Contact Information

Steve Jagels

Precision Polymer Engineering, Ltd.

1-856-535-8181

steve.jagels@prepol.com

http://www.prepol.com

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About the Presenter:

Steve Jagels is Business Development Manager for Precision Polymer Engineering, Ltd. He specializes in elastomer sealing in Oil and Gas, Power Generation and Chemical Process Industries. Steve is a graduate of Tulane University and the University of Pennsylvania Wharton School. He has been involved in the rubber industry for 14 years and has held a variety positions in both technical and business roles.