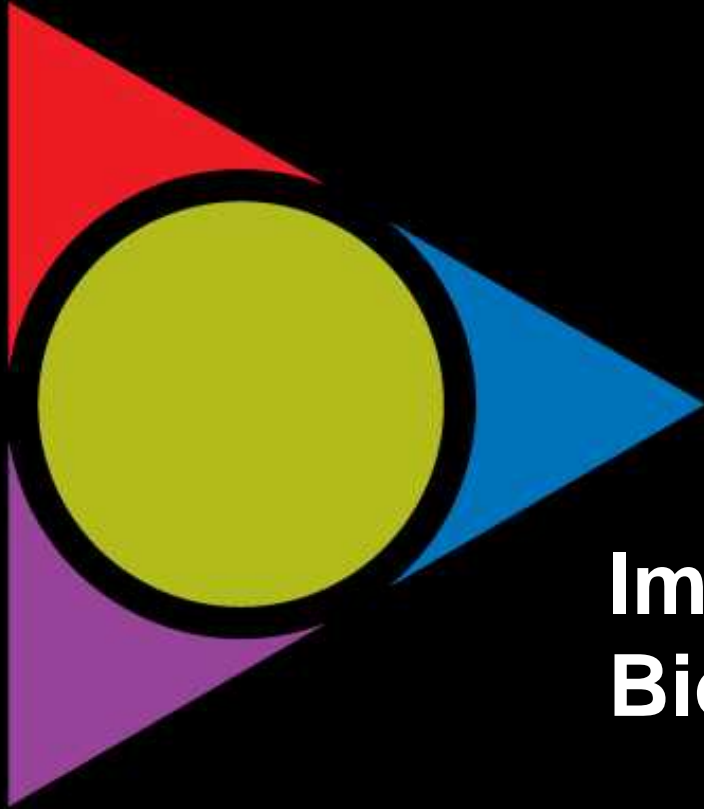


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Improving the Stability of Biodiesel using Additives

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Additives to Improve Biodiesel Stability

Degradation of Biodiesel

Oxidation

Field concerns surrounding Biodiesel degradation

Impact of Stability Additives









Summary

Degradation of Biodiesel

Food - Cooking Oils - Whole oils / Triglycerides

-  **“Going Rancid” - Production of undesirable odors or flavors**

Fuel - Biodiesel - FAME

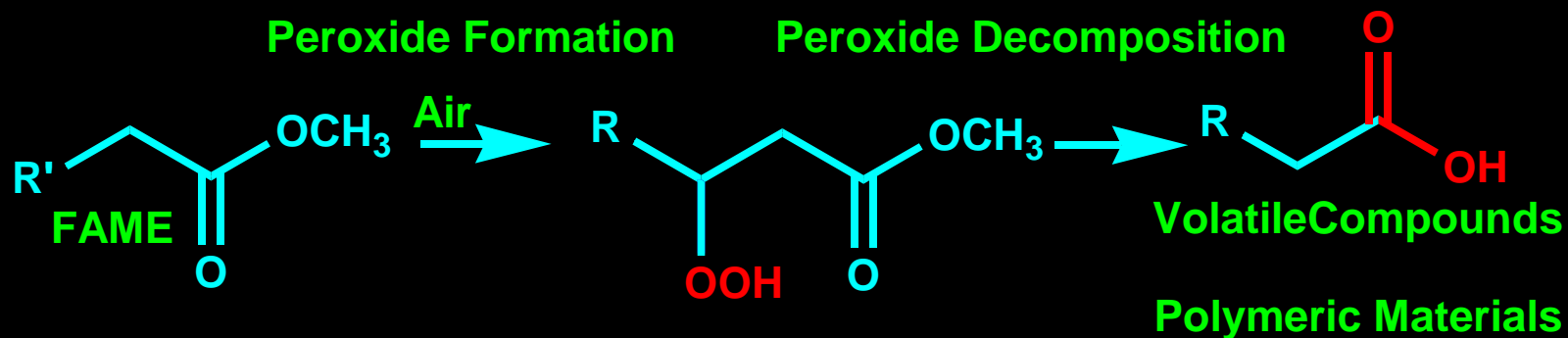
-  **Increase in Acidity**
 -  **Corrosion**
-  **Increase in Viscosity**
 -  **Deposit formation**
 -  **Fuel filter plugging**
 -  **Injector Deposits**
 -  **Fuel economy**
 -  **Excessive emissions**

Causes of Biodiesel Degradation



▶ Oxidative Degradation

- ▶ Process in which exposure to air (and more specifically oxygen) causes changes in the oil
- ▶ Main mode of Bio Diesel instability



Causes of Biodiesel Degradation

► Factors influencing oxidation

► Biodiesel composition

► Metals

► Light

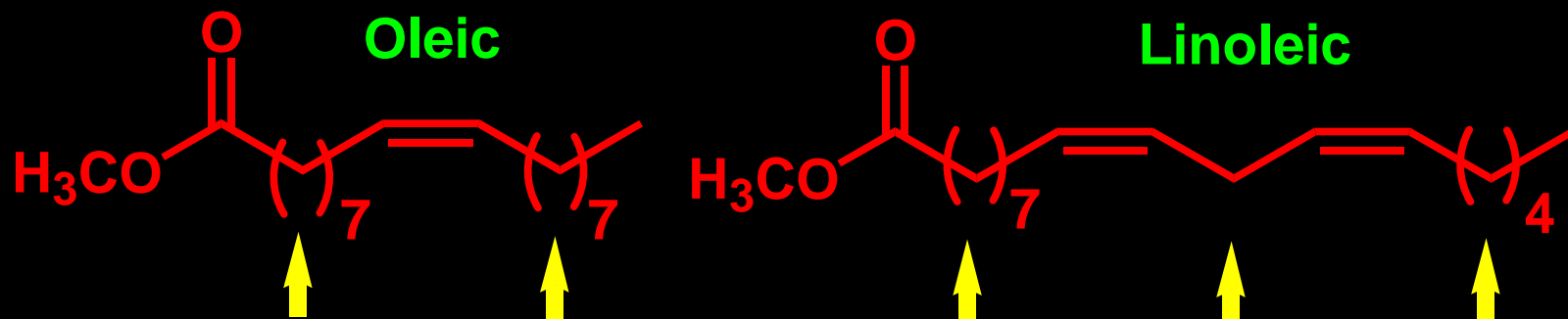
► Heat



Oxidation Degradation

► Influence of FAME composition

► Allylic hydrogen most susceptible



Main Component

Rape (18:1)

Soy (18:2)

Linseed (18:3)

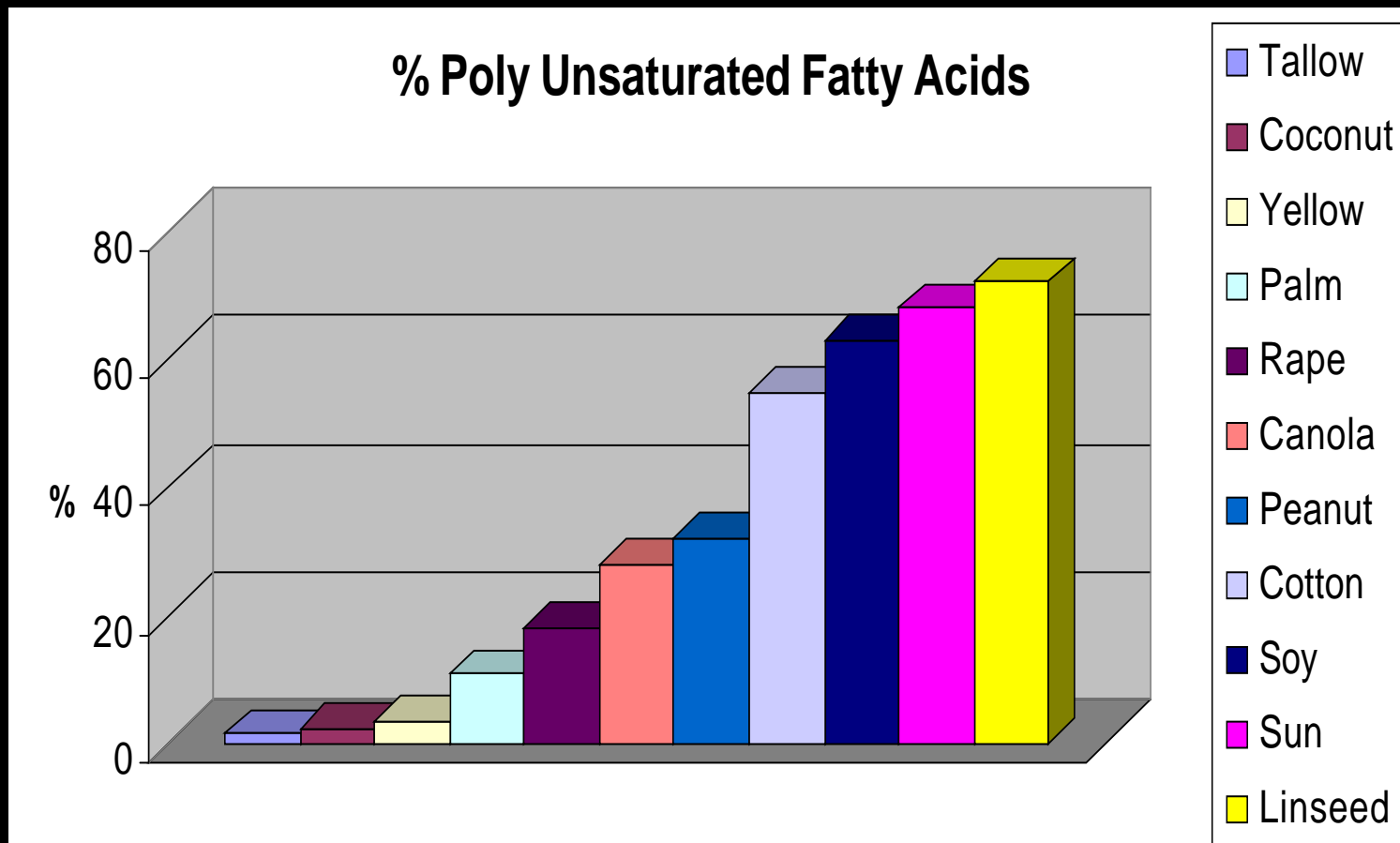
Oxygen Uptake Rates

1

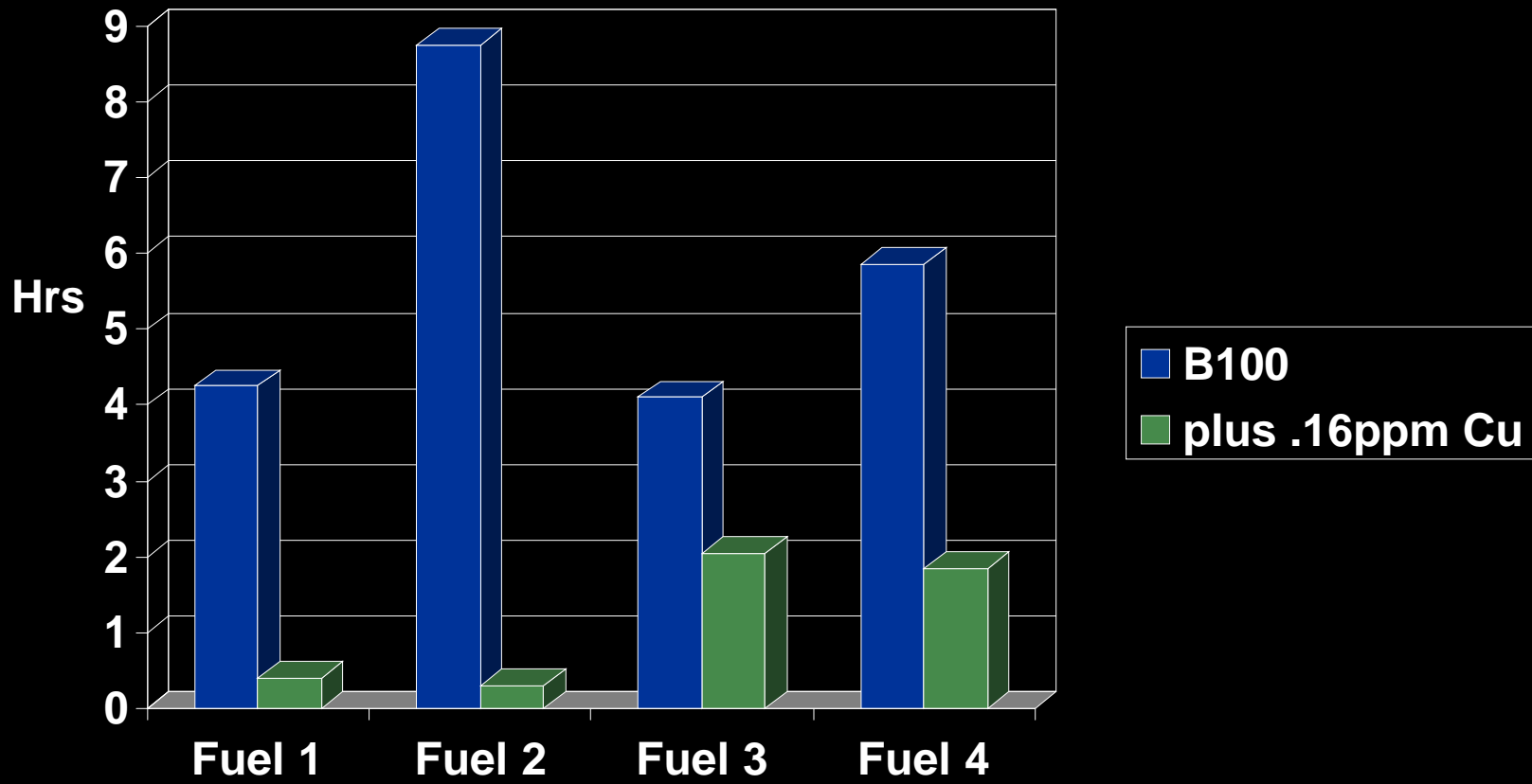
41

98

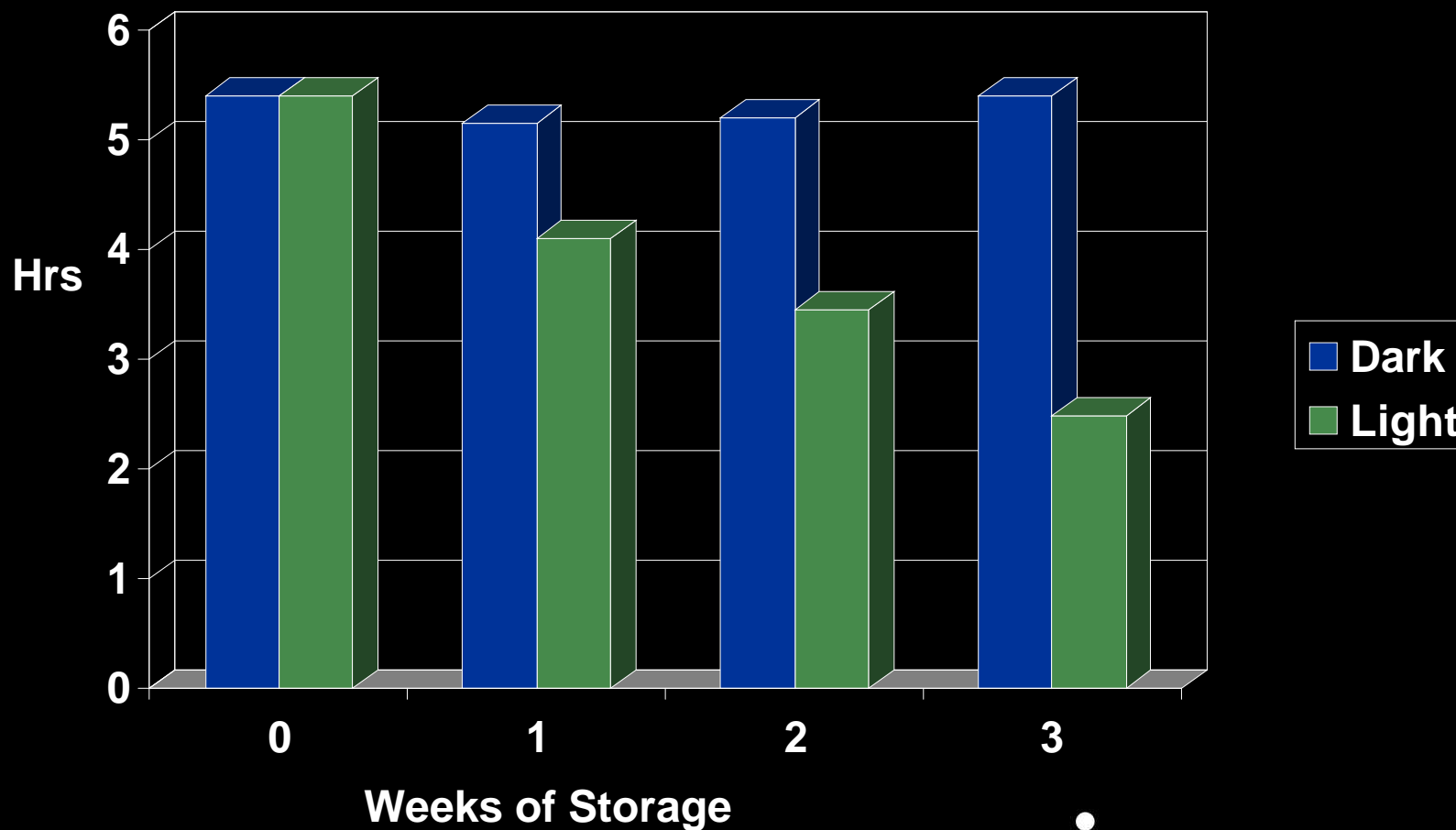
Influence of FAME Composition



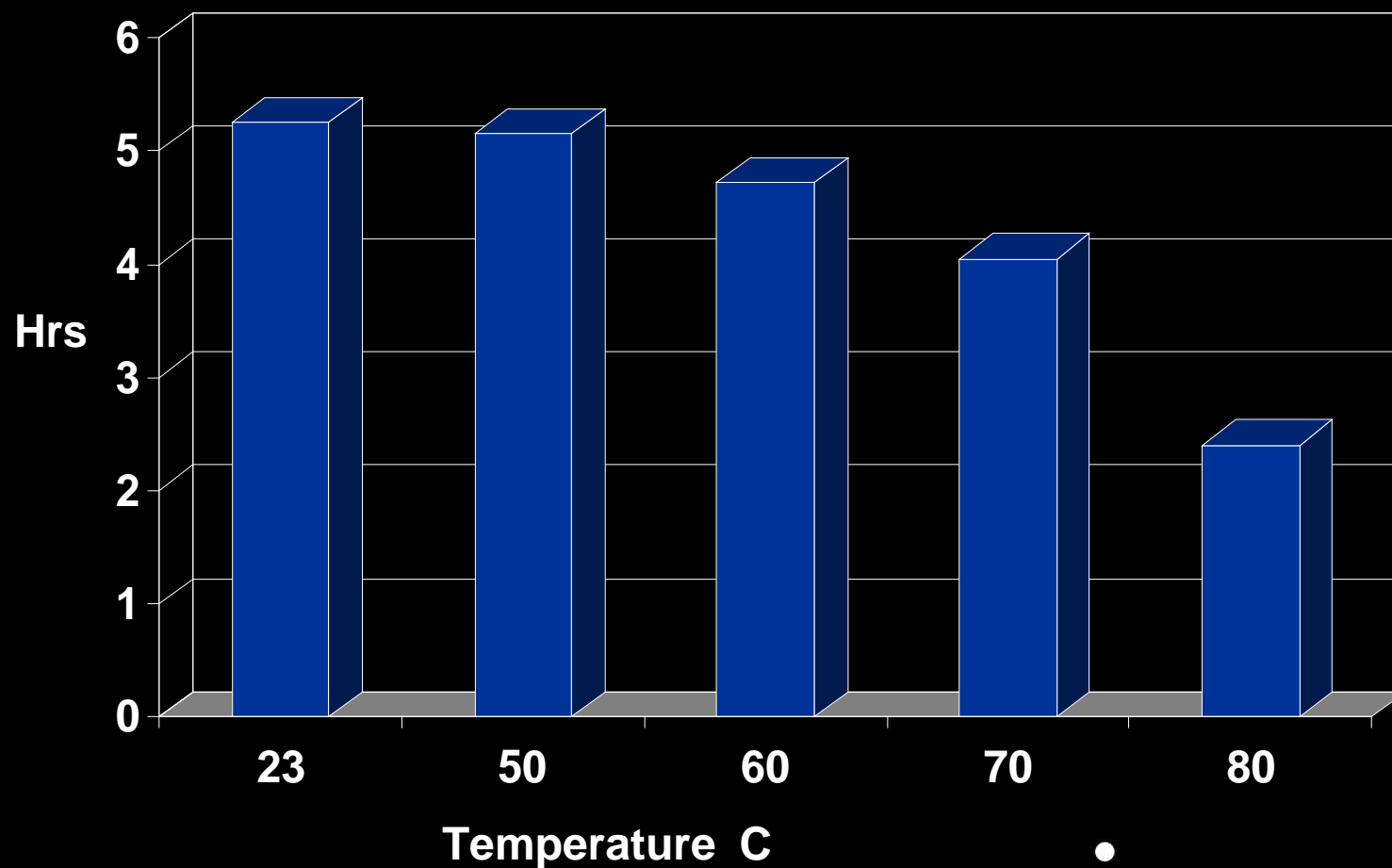
Influence of metal contamination

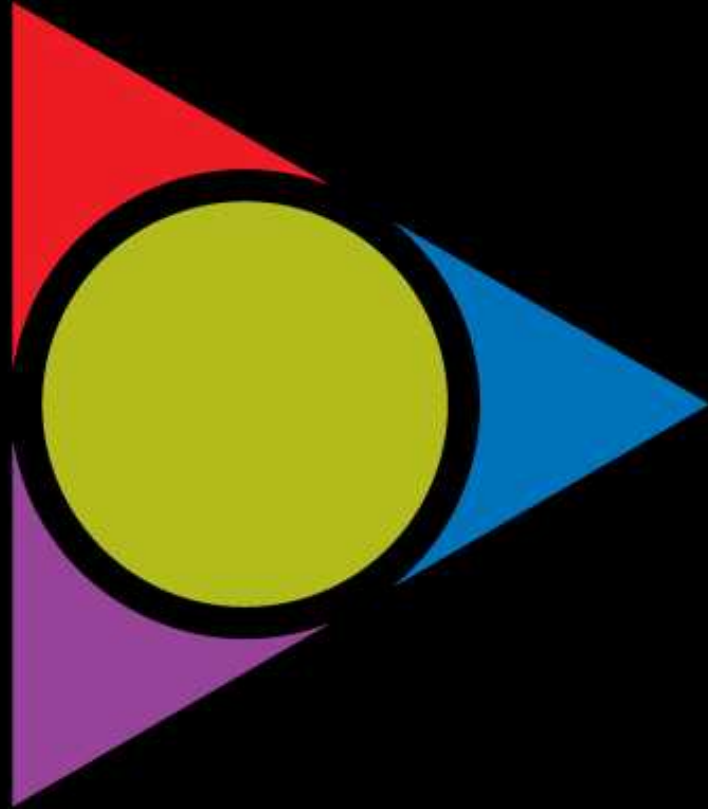


Influence of Light



Influence of Heat





Stability Field Concerns

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Stability - Field Concerns

▶ Protecting Stored Product

- ▶ Protecting D 6751 compliant fuel during storage (maintaining 3+ hr induction period)

▶ Remediation of Unstable Product

▶ Co-mingling lots

▶ Metal Contamination



Stability - Field Concerns

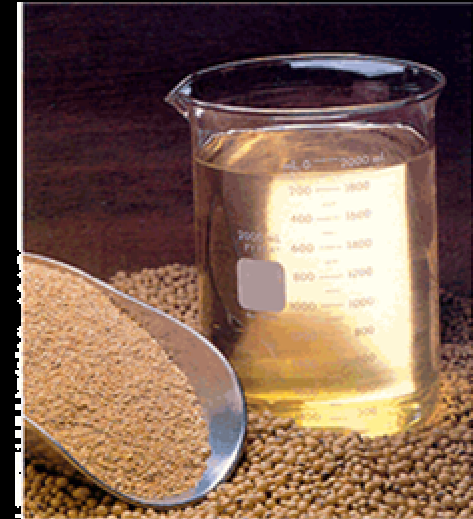
●▶ Protecting Stored Product

●▶ Remediation of Unstable Product

●▶ Correcting Stability of fuels with Induction period below 3 hours

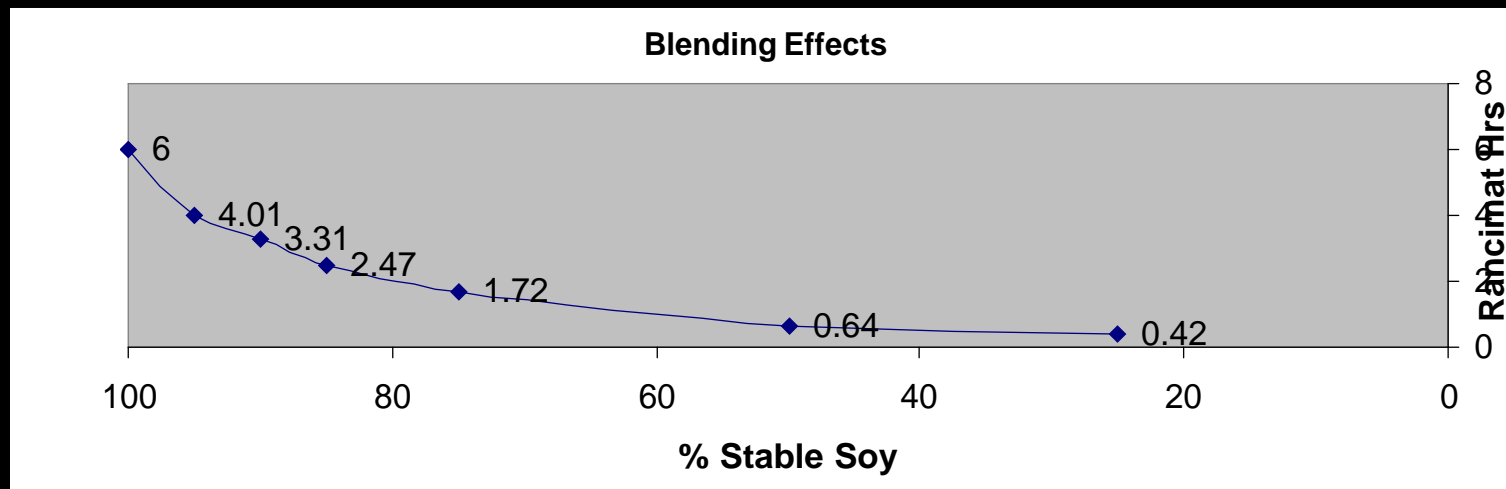
●▶ Co-mingling lots

●▶ Metal Contamination



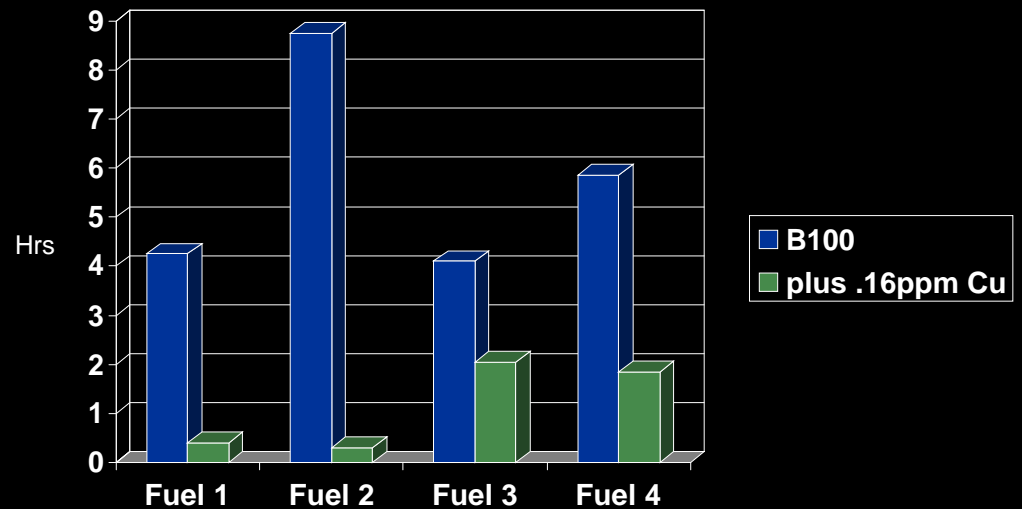
Stability - Field Concerns

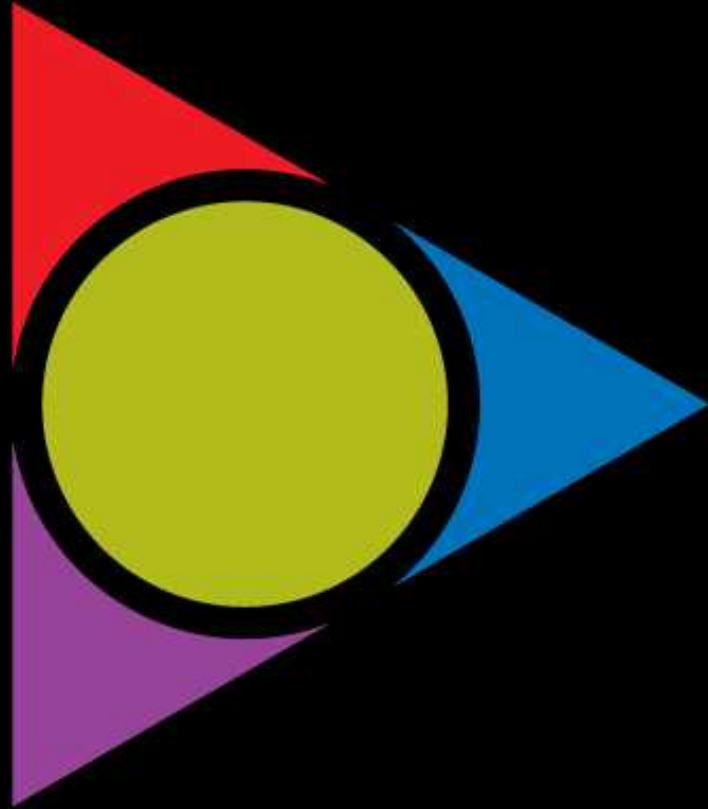
- Stored Product
- Unstable Product
- Co-mingling lots
- Stabilizing mix fuels - mixing current inventory (aged) fuel with new shipment



Stability - Field Concerns

- Stored Product
- Unstable Product
- Co-mingling lots
- Metal Contamination**
 - Protecting against metal catalysed oxidation










Use of Additives to provide Biodiesel Stability



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Additive Requirements





Superior Stability Enhancement

-  Inhibit Peroxide Formation
-  Minimize effects of Peroxide Degradation
-  Excellent against Metal Catalyzed Oxidation
-  Protect against Acid Induced Degradation
-  Diminish polymer, gum and sediment formation

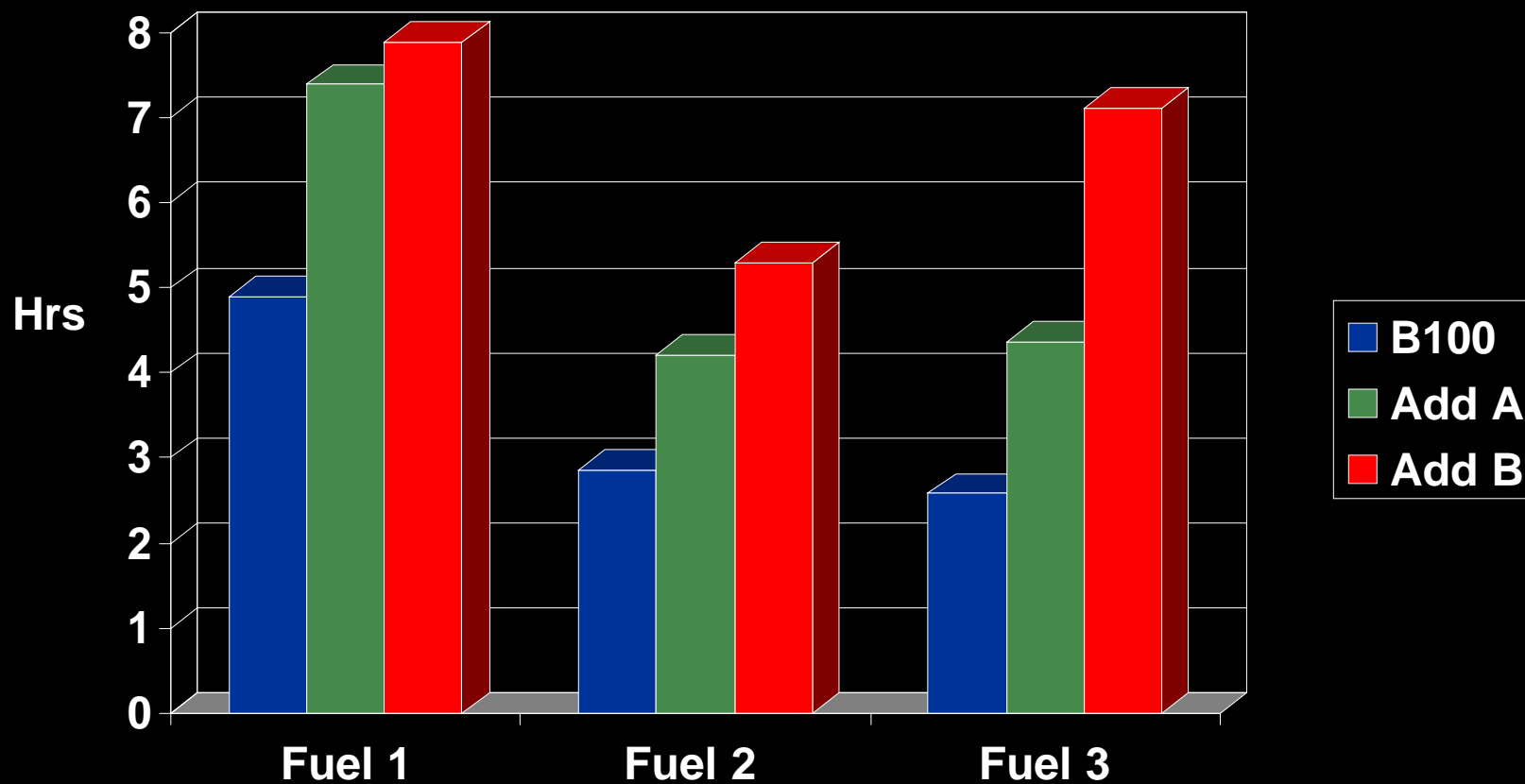
Fully Compatible with B100 and Bxx Blends

-  Compatible with other petroleum fuel additives
-  Components with long history of “No-Harm” in fuel applications

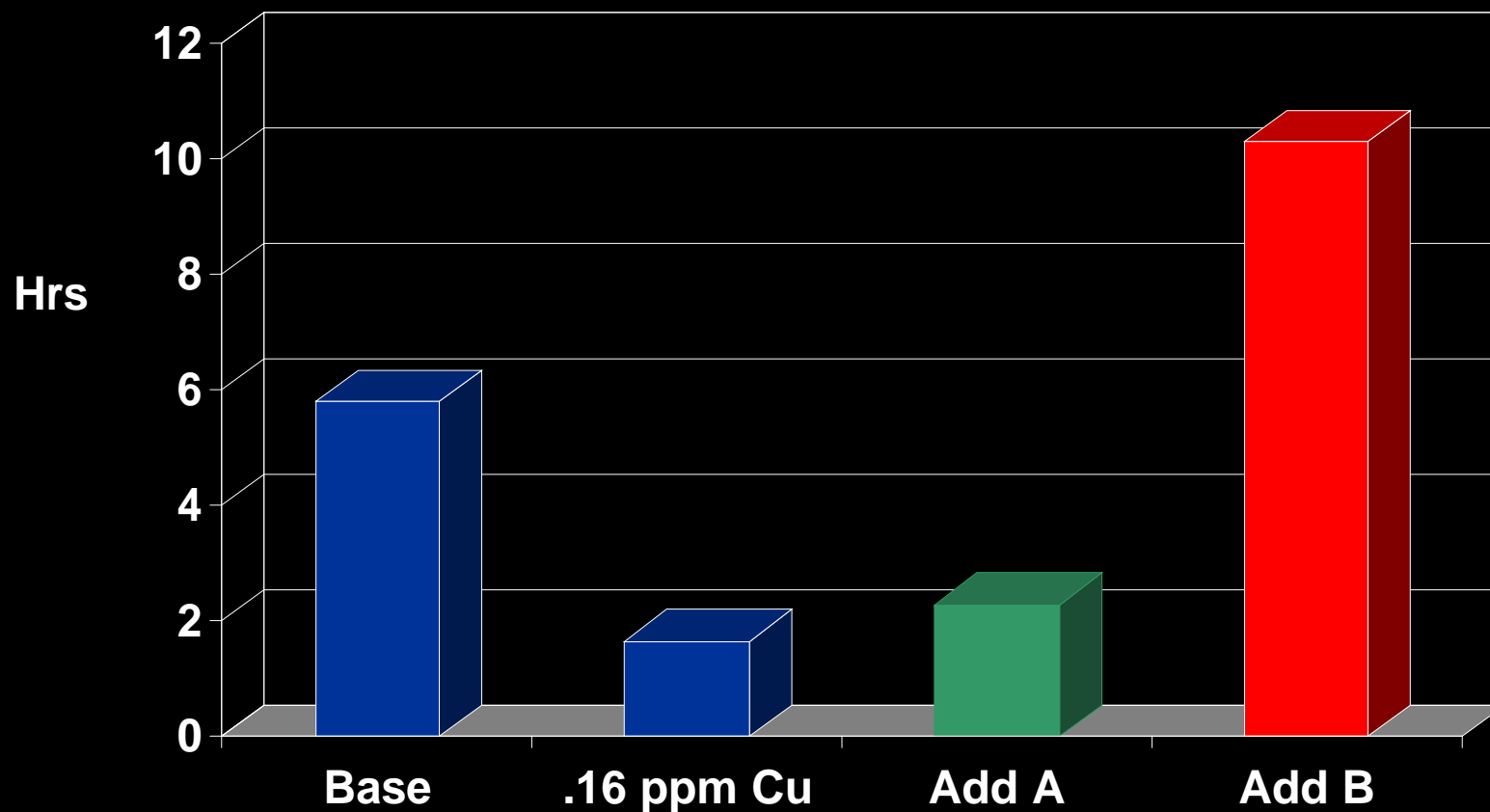
Use and Handling

-  Good low temperature handling
-  Stable during storage
-  Consistent lot-to-lot performance
-  Cost Effective Treatment

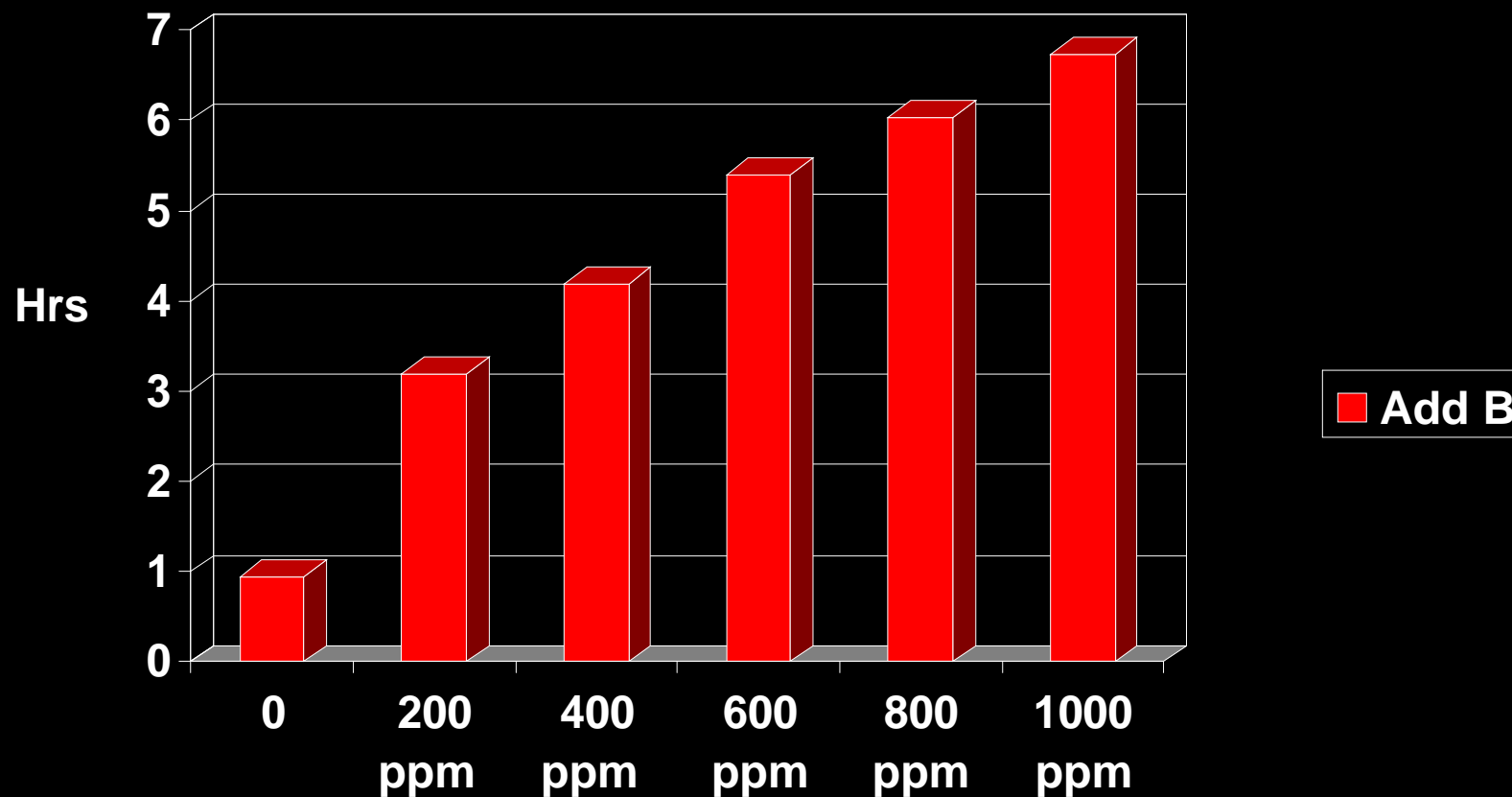
Additive Performance



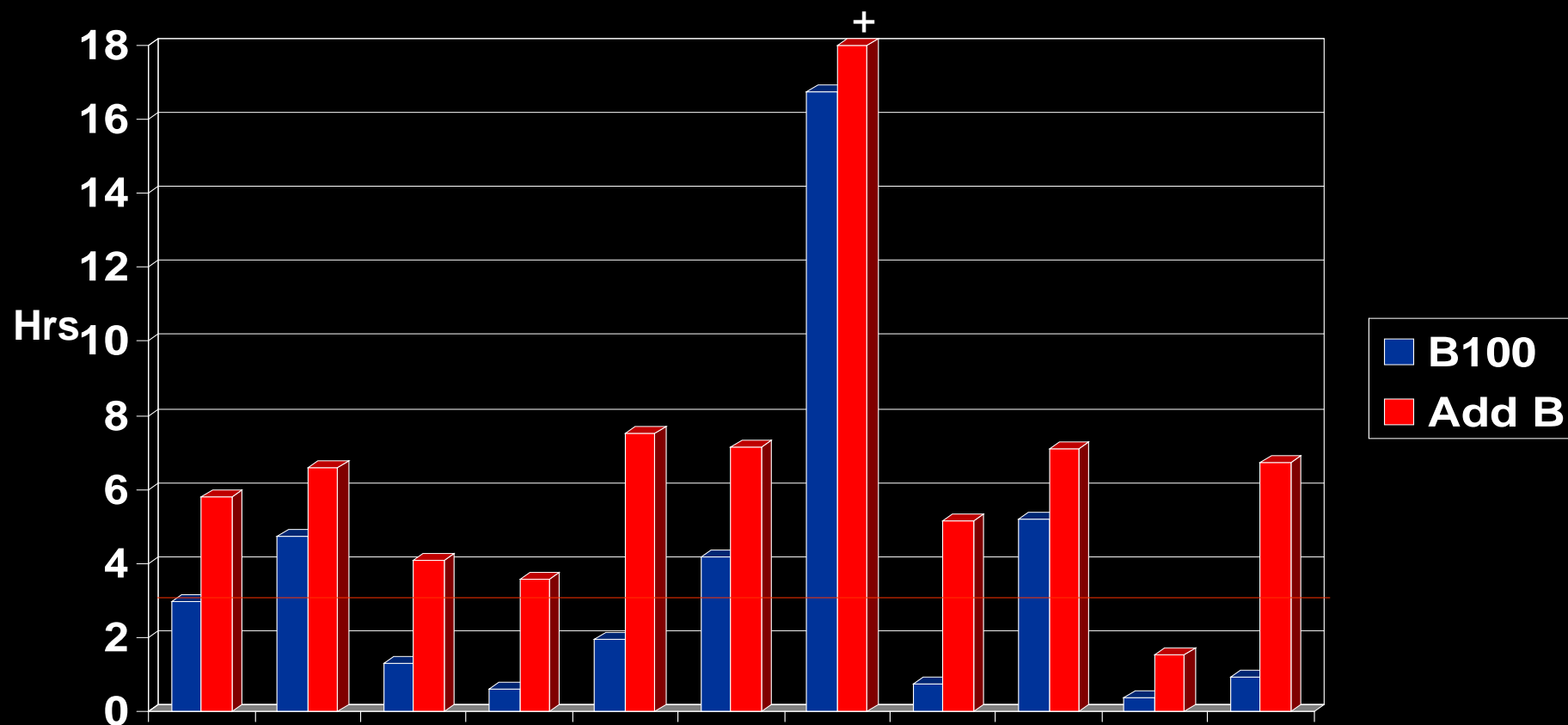
Additive Performance



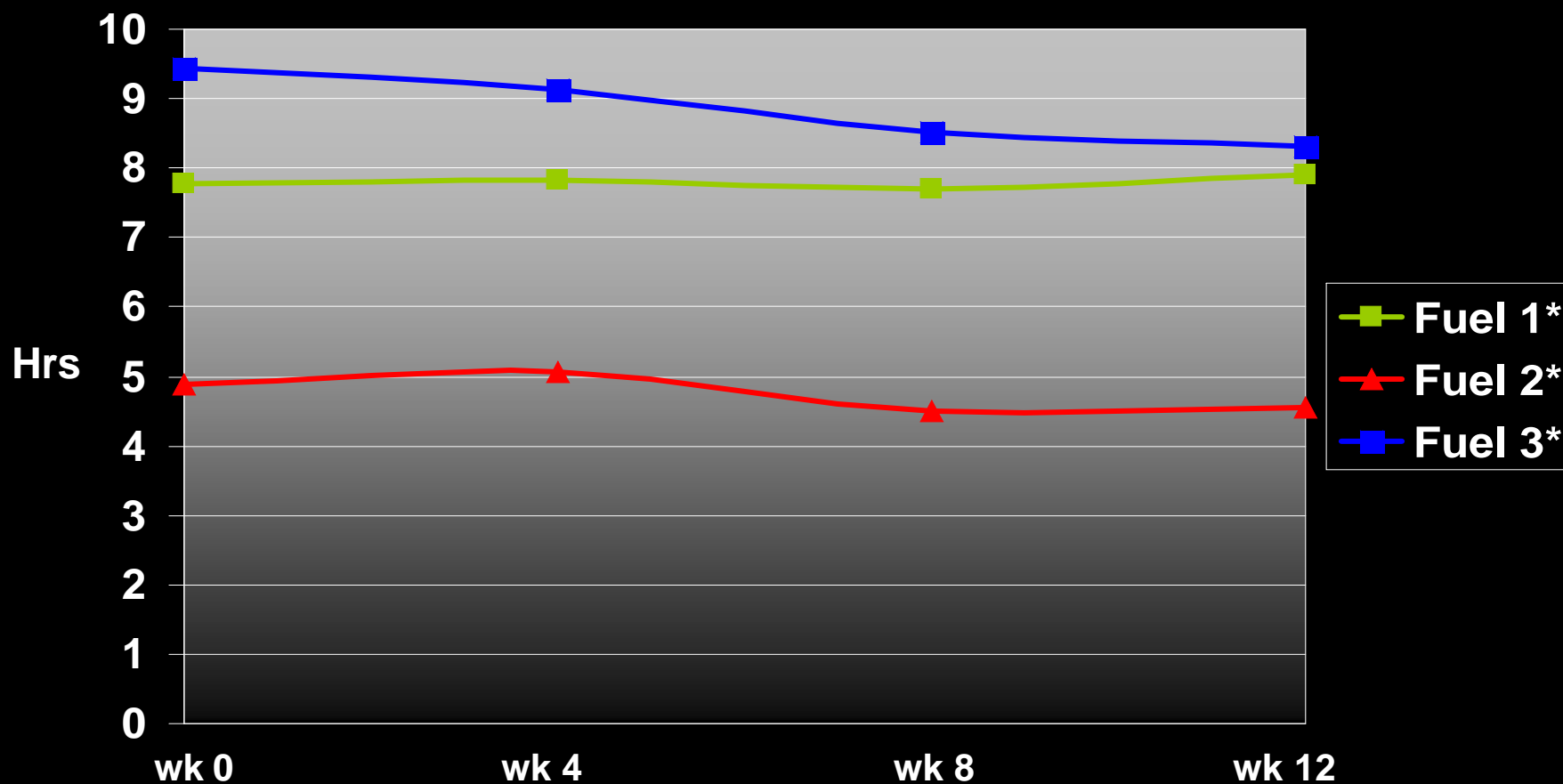
Additive Performance



Additive Performance



Additive Performance



* Treated Fuel aged at 20 C for 12 weeks

Summary

- ▶ Biodiesel is less stable than conventional Diesel
 - ▶ Susceptible to oxidative degradation
- ▶ Correctly formulated additives will help meet and maintain Biodiesel stability
- ▶ Additives need to be chosen carefully to ensure no harm in use.

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