

The Green Fuel Option for the Oilheat Industry

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**Presented by C.R. Krishna and R.J. McDonald
Brookhaven National Laboratory**

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The Green Fuel Option for the Oilheat Industry

- **What is Biofuel?**
 - **A liquid fuel derived primarily from plant sources**
 - **Ex: Biodiesel from vegetable oils, such as soy etc.**
 - **Biodiesel is now available to ASTM D6751-02**
 - **Biodiesel specified for diesel engines mainly**
 - **ASTM considering specification for heating oil**
 - **Potentially cheaper biofuels for boilers**
 - **Less stringent requirements than in D6751-02**

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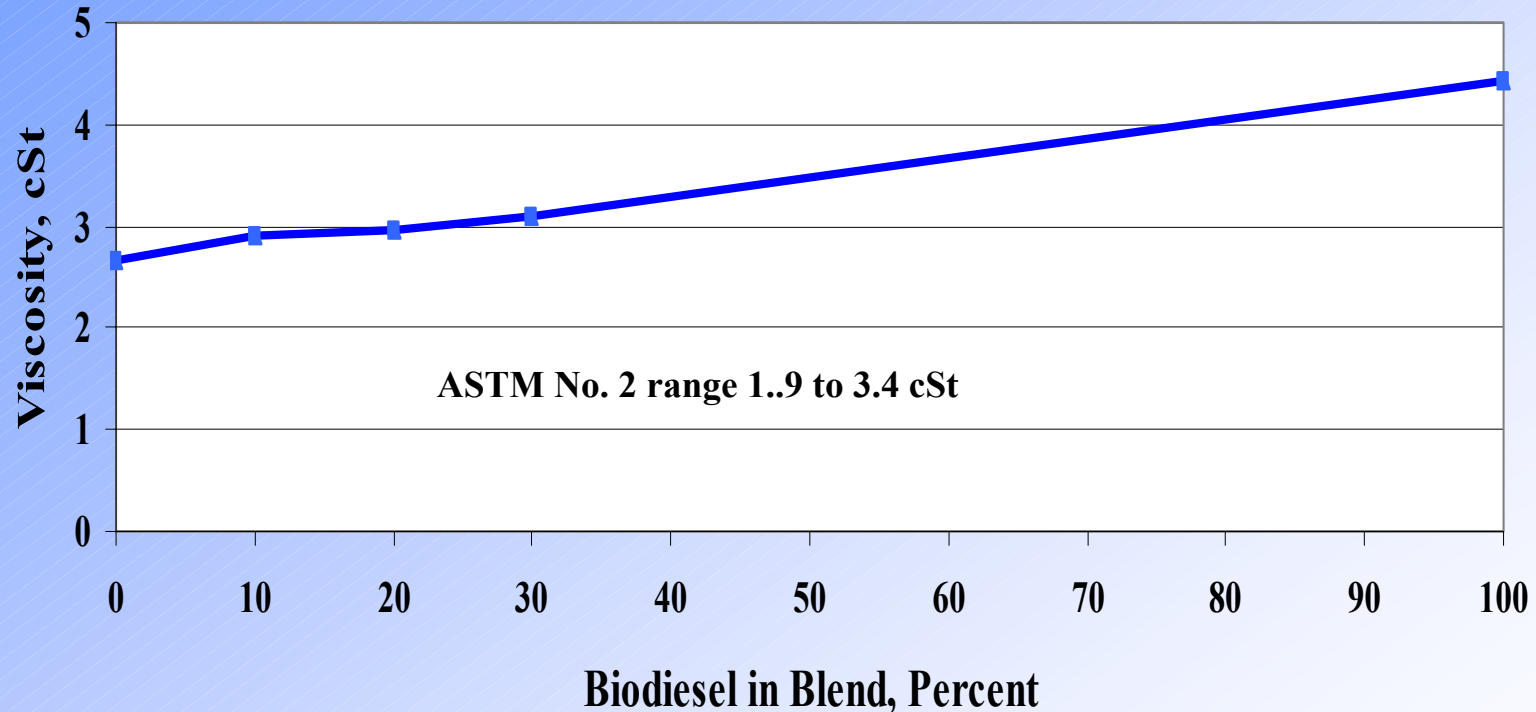
- **Biodiesel is typically made by transesterification**
 - **Vegetable oil source reacted with alcohol**
 - **Process is such that ‘backyard’ production exists!**
 - **In commercial production, glycerine and fatty acid contents reduced to meet ASTM specifications**
 - **Biofuel used in tests is higher in fatty acid content**
 - **It is a byproduct of a vitamin E plant**

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- **What is in this Presentation**
 - **Results from boiler tests of biodiesel blends in No. 2 fuel oil**
 - **Results from field tests of biodiesel blends**
 - **Compare important properties of biodiesel and a biofuel**
 - **Results from boiler tests of biofuel blends in No. 2 fuel**

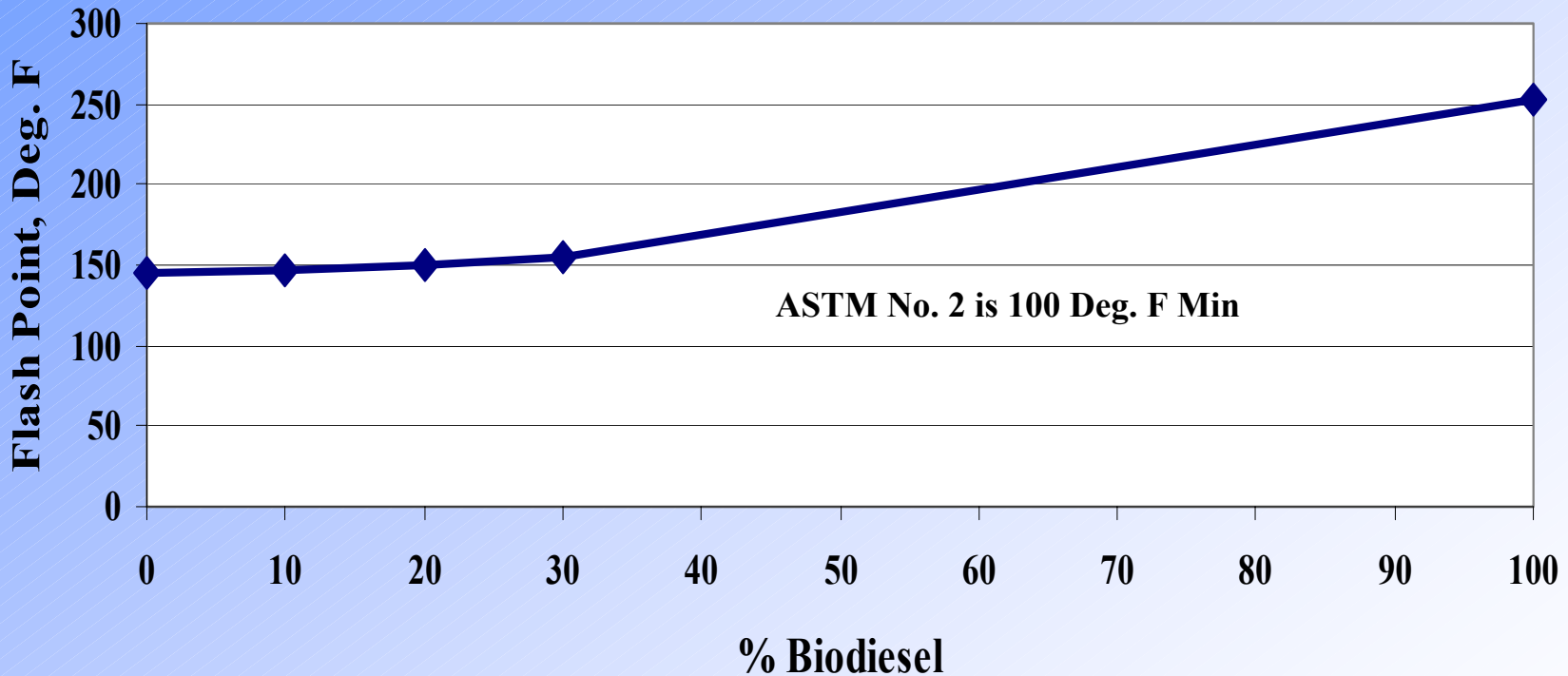
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Viscosity of Biodiesel Blends



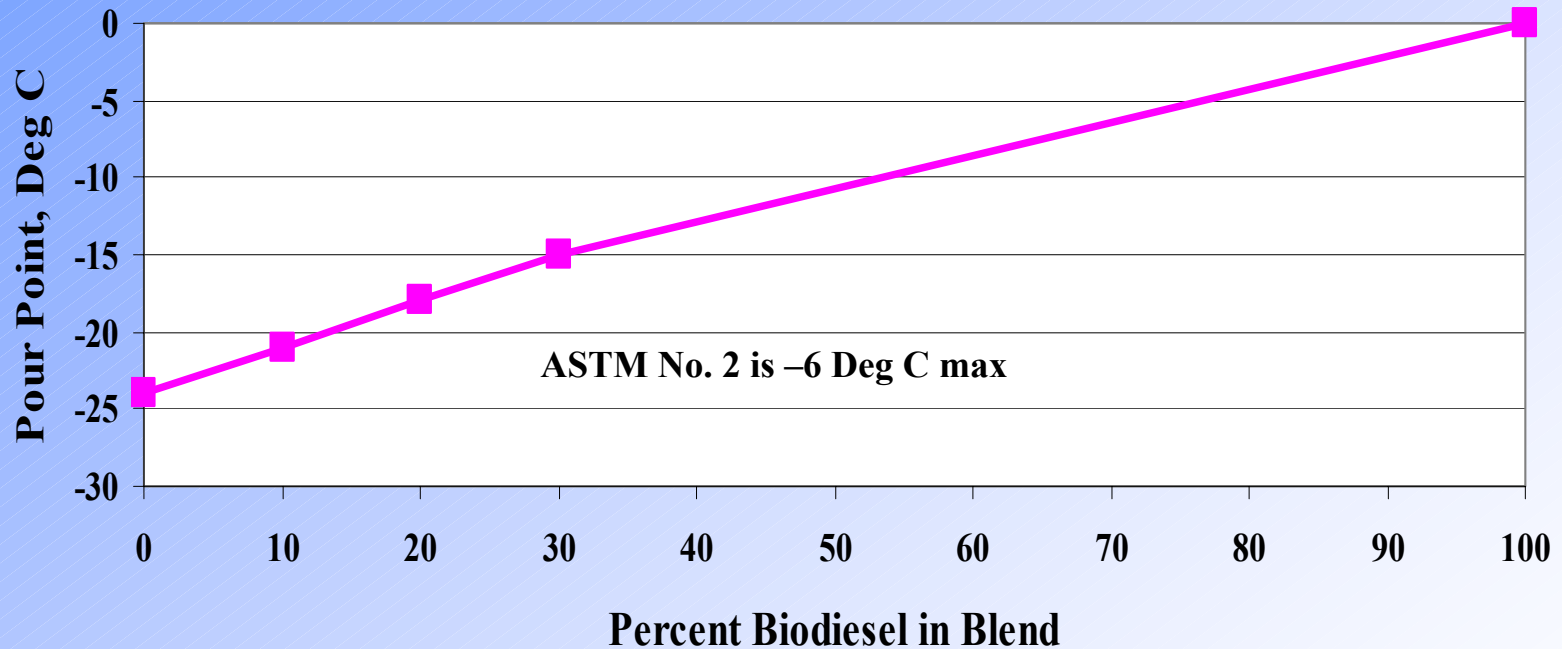
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Flash Points For Biodiesel



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Pour Point of Heating Oil Blends



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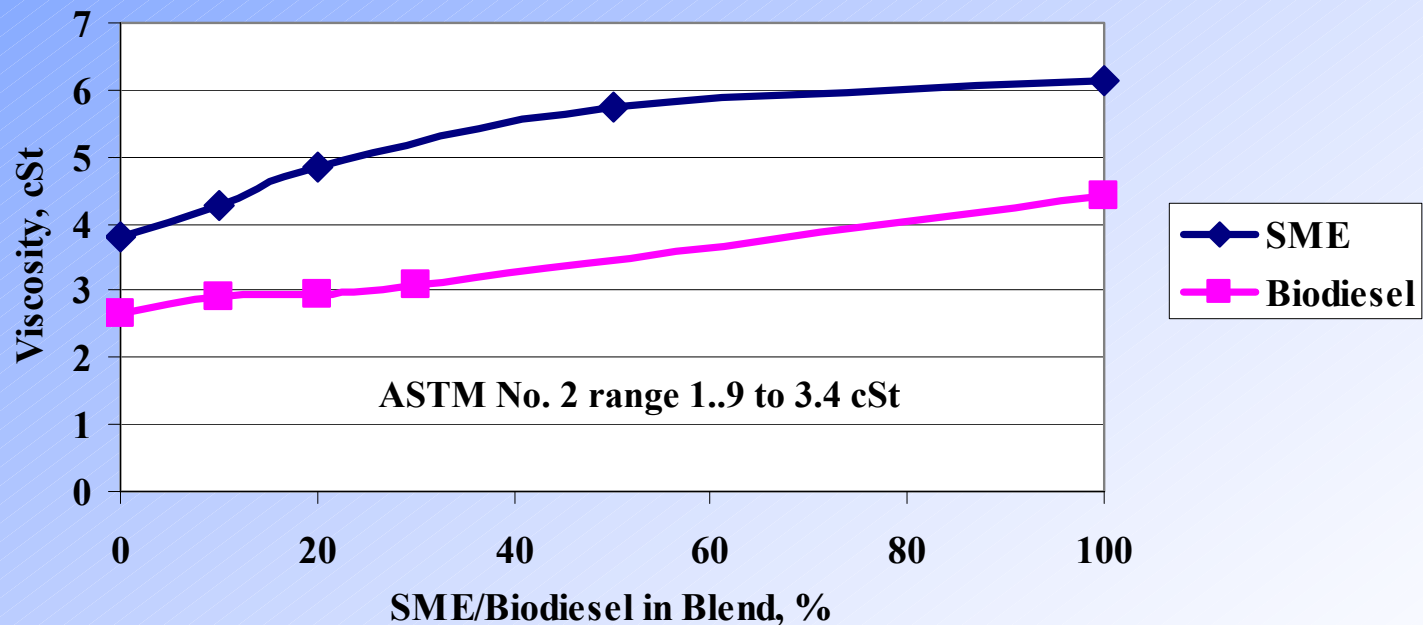
- The previous slides on property suggest
 - Blends up to 50% of this biodiesel (B50) can be burned in place of ASTM # 2 fuel
 - Properties relevant to storage, additives and materials have to be tested
 - Economics have to be established
 - Field tests have been successful with B20

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- Properties of biofuel, soy methyl ester (SME), will be compared with those of biodiesel

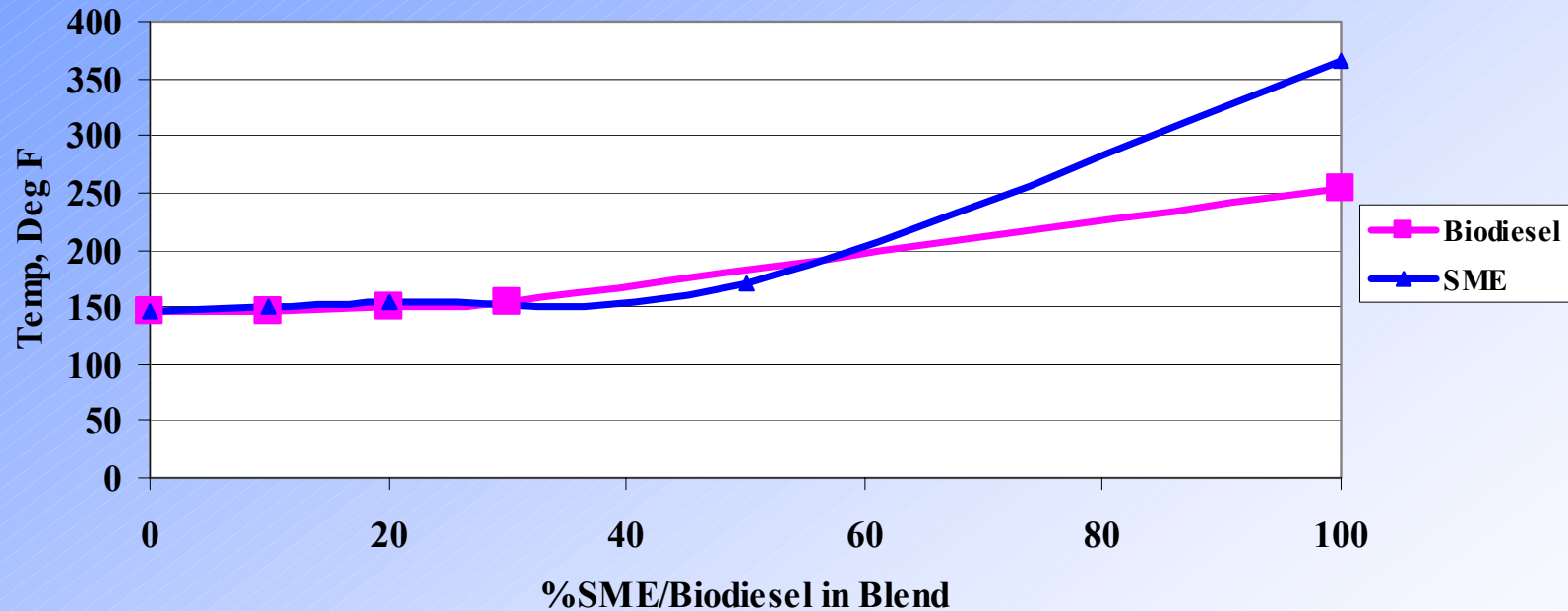
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Viscosity of biodiesel and biofuel compared



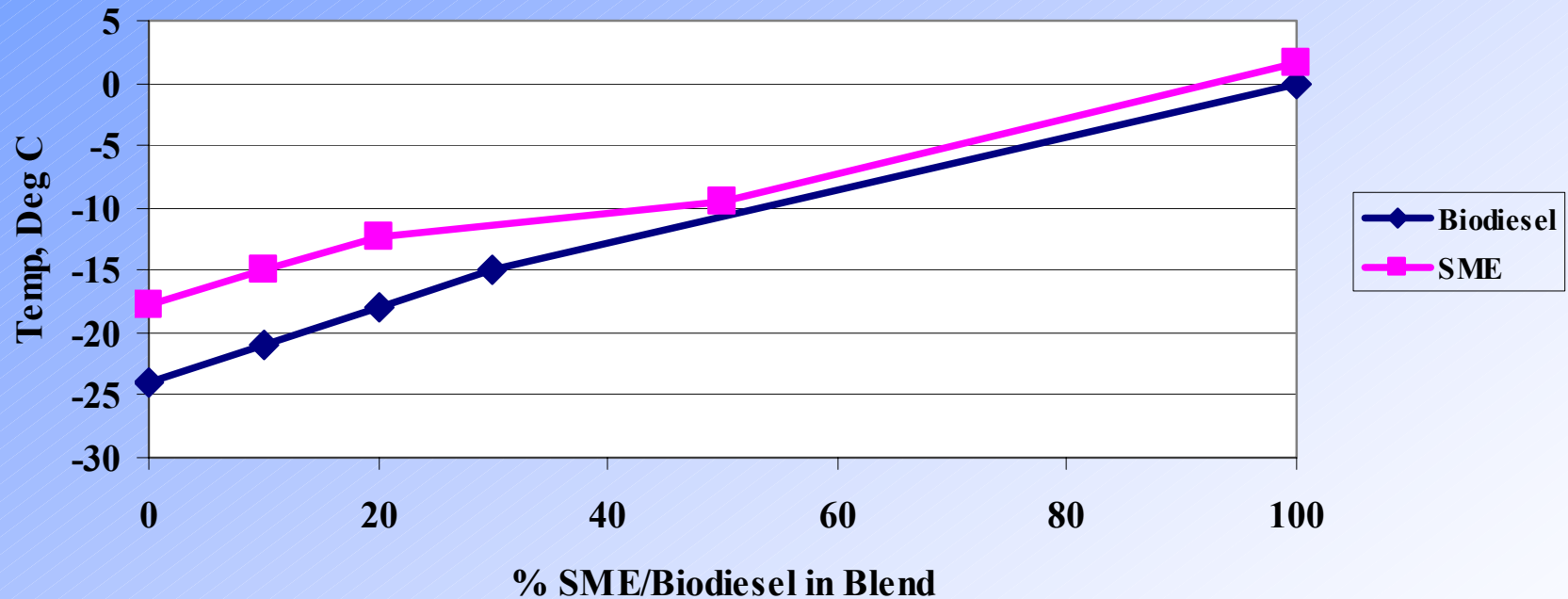
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Flash Points of biodiesel and biofuel compared



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Pour Points of biodiesel and biofuel compared



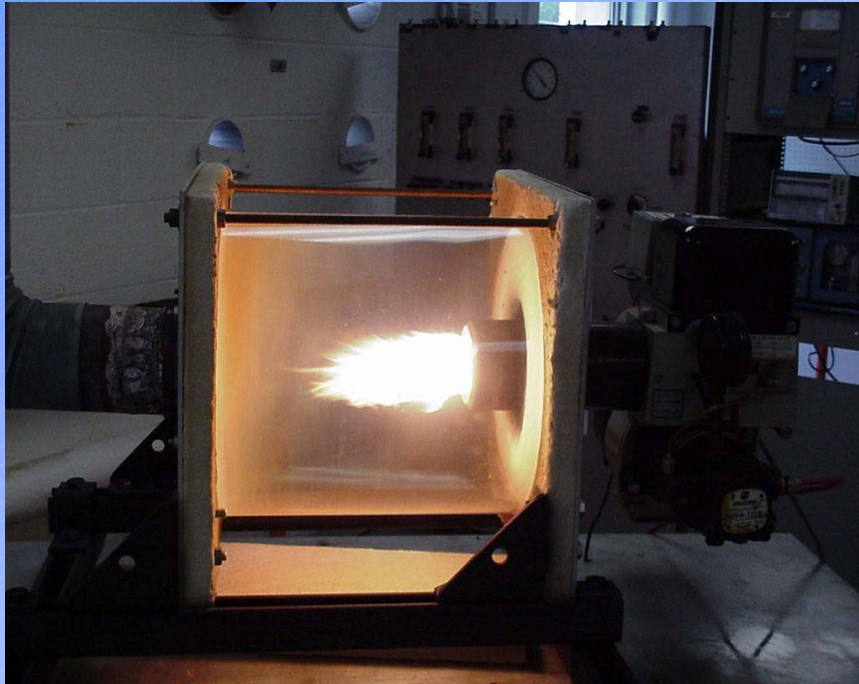
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- **Conclusions from comparing biofuel and biodiesel properties**
 - **Viscosity of the biofuel blends are higher and higher than ASTM # 2 fuel as this sample of fuel oil itself has a high value**
 - **Flash points are comparable**
 - **Pour points for the biofuel are higher and again because of the higher value for the base # 2 fuel**
- **Blends of up to 50% of this biofuel could be burned as a replacement for # 2 fuel with the same caveats as with biodiesel regarding storage etc.**

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Combustion properties

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Biodiesel flame



Fuel oil flame

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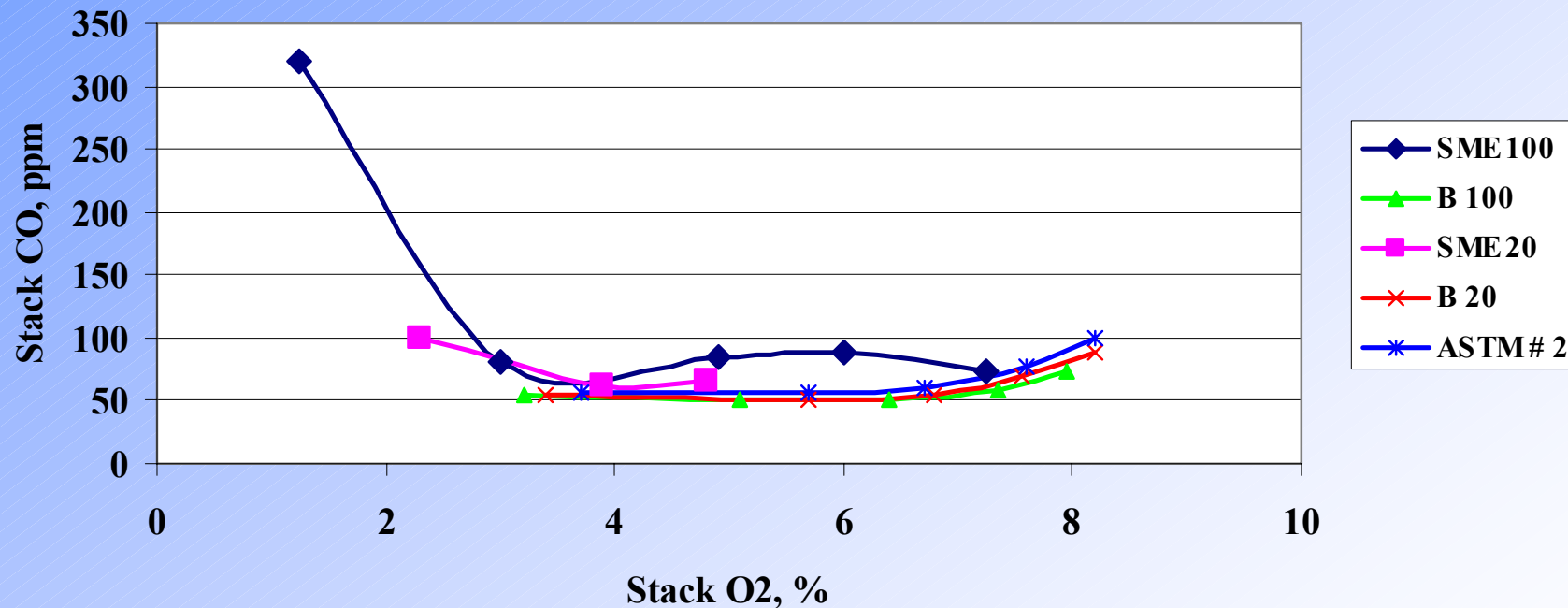
Residential Boiler Test Setup



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Residential Boiler Results

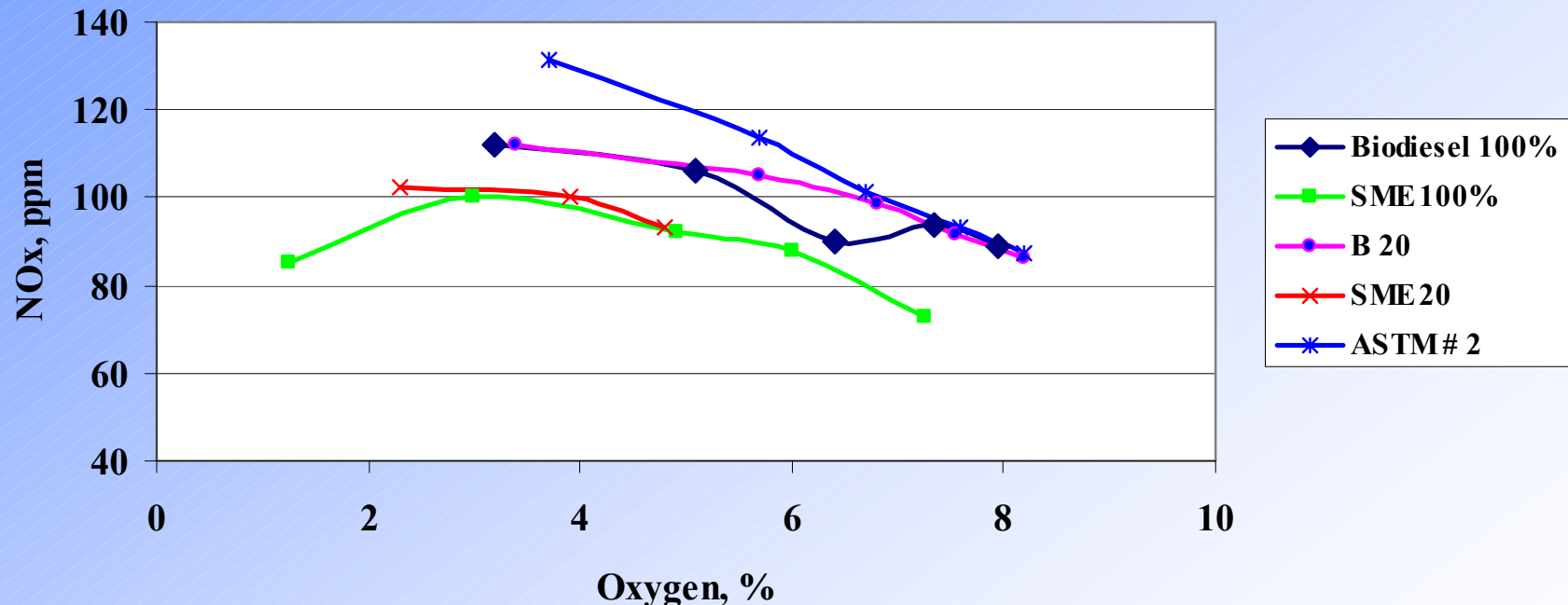
CO vs O2 compared



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Residential Boiler Results

NOx from biofuels compared



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- **Conclusions from residential boiler tests**
 - **Carbon monoxide emissions are similar for both blends and the ASTM # 2 fuel at similar excess air (stack O₂)**
 - **Nitrogen oxide (NO_x) emissions are lower for the blends compared to # 2 fuel at similar stack O₂ levels**

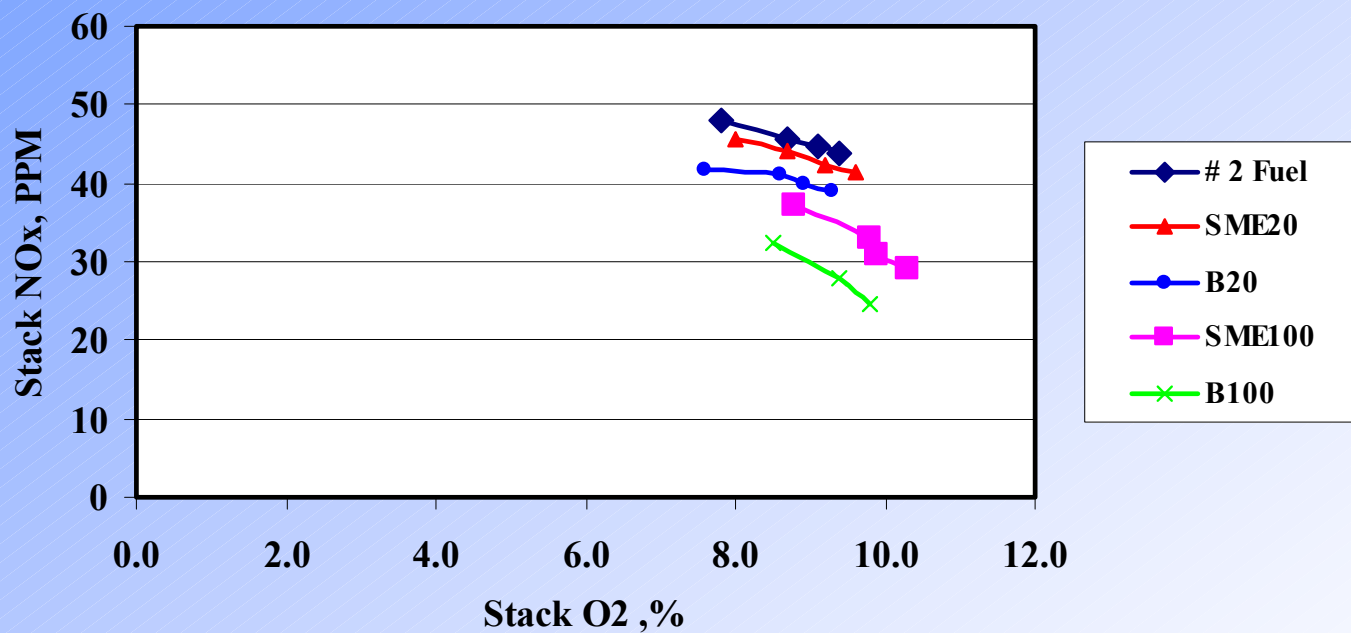
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Brookhaven Science Associates
U.S. Department of Energy

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NOx in Commercial Boiler compared



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- **Conclusion from commercial boiler tests**
 - **NO_x emissions are reduced with the blending of both biodiesel and SME**
 - **100% biodiesel results in lower values of NO_x than 100% SME**

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- **Field Tests of Biodiesel blends**
 - **Conducted by Abbott and Mills in Newburgh, NY**
 - **Second season of supplying B20 to about 100 homes**
 - **Over 60,000 gallons delivered**
 - **Report no fuel related problems thus far in storing, blending, delivery and use**



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- Distributors of Bio-Diesel for the Transportation Sector are Already Established and Growing
- Opportunities Exist for the Oilheat Industry To Take Advantage of this Green Fuel
- Organizations and Contacts Pioneering the Use of Bio-heating Fuels
 - **Brookhaven National Laboratory - C.R. Krishna**
 - **Abbott & Mills - Ralph R. Mills**
 - **Warwick School District - Paul Nazzaro**
 - **Chewonki Foundation - Peter Arnold**
 - **Frontier Oil Company - Brad Taylor**
 - **Purdue University - Nick Vanlaningham**

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- **Conclusions**

- **Biodiesel and the biofuel tested here can be burned in blends up to 50% with little change in performance**
- **Field tests with 20% biodiesel blend has been successful**
- **Long term use in higher than 20% blend needs study**
- **Ultra low sulfur, NO_x reductions, CO₂ recycle and biodegradability are environmental benefits**
- **Cost of biodiesel is higher; biofuels may be cheaper**
- **Marketability of environmental benefits needs study**

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 - **Thanks to NYSERDA for support of our work**
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 - **Thanks to ADM and Gerry Downing for the fuel and for cooperative support**
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