

# Viscosity Modification in Base Oils

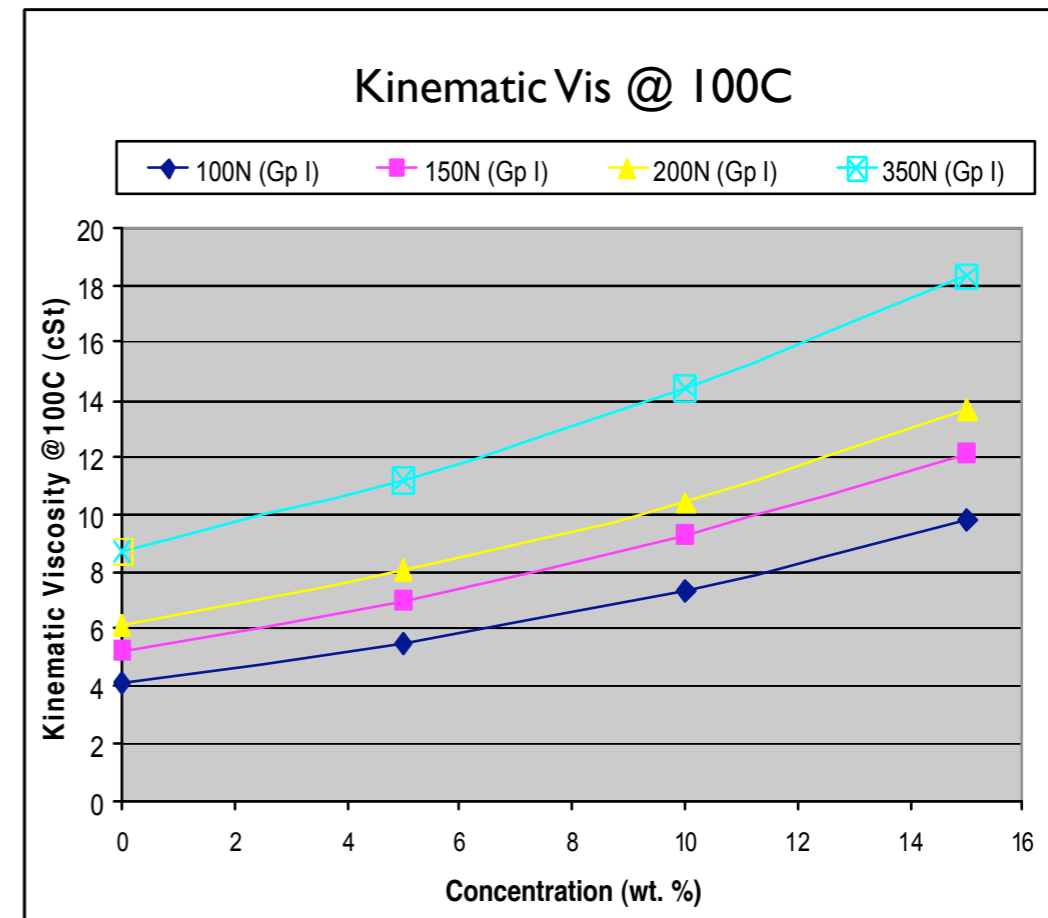
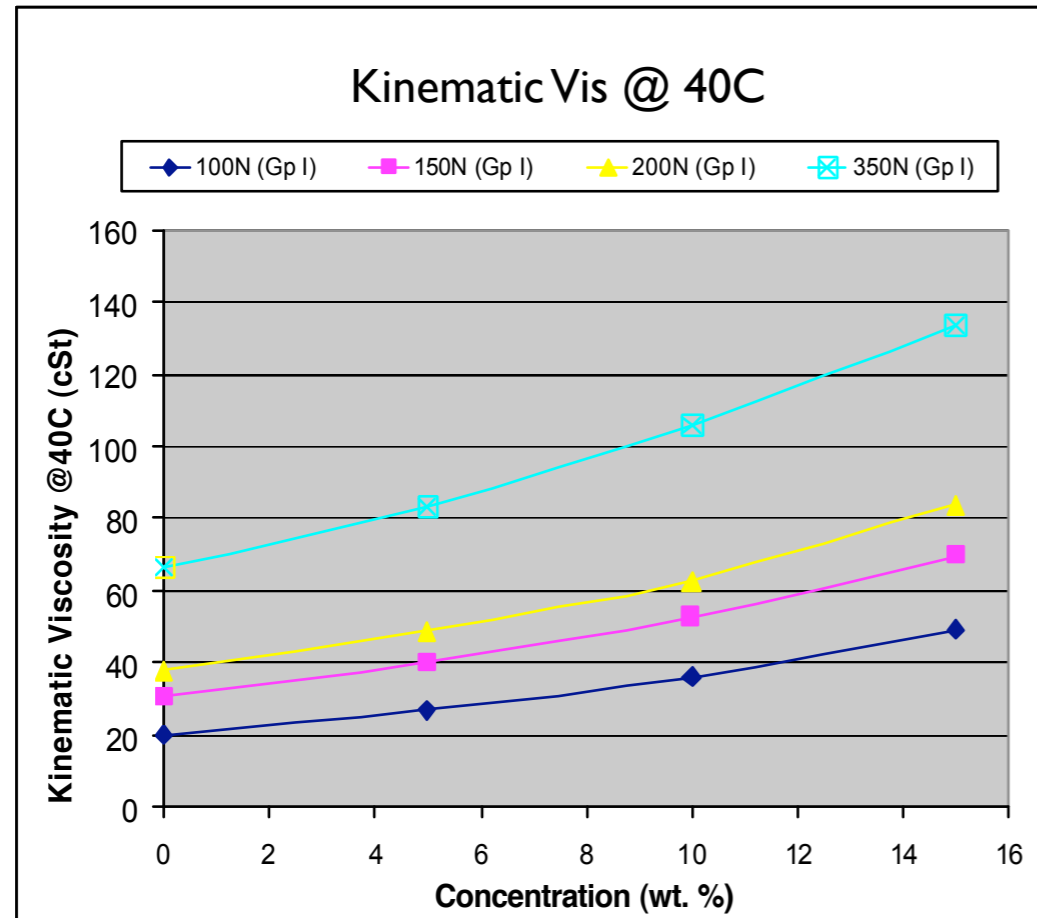
Utilizing S-Flow V-Series Products

# S-Flow Viscosity Modifiers

- S-Flow VI20I and V6200 are alkyl methacrylate co-polymers in a highly refined mineral oil
- They provide excellent shear stability and viscosity modification
- VI20I is targeted for industrial and automotive applications where shear stability is critical
- V6200 is used in applications where viscosity increase is more critical than shear stability

# S-Flow VI20I

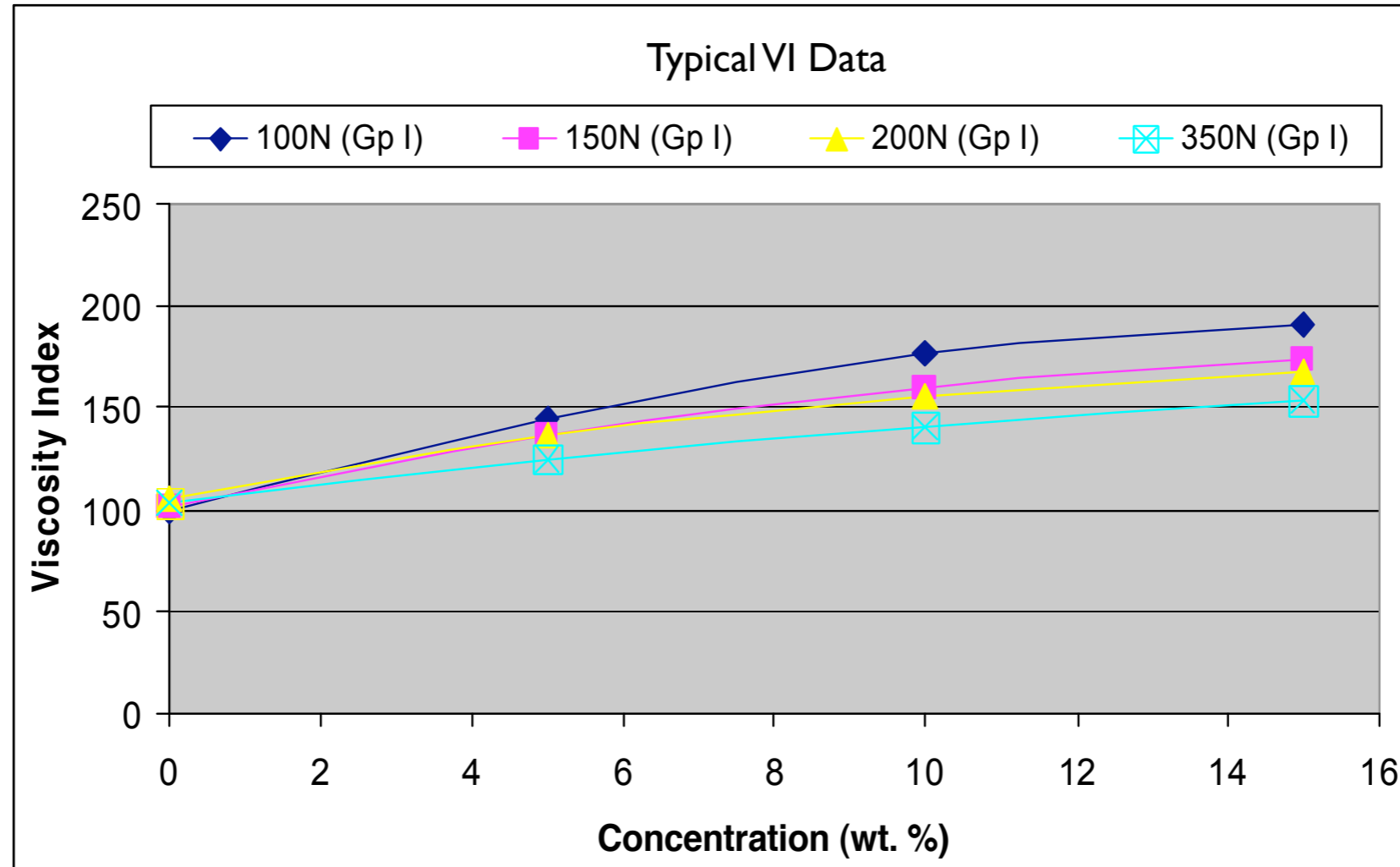
## Typical Thickening in Group I Base Oil



**Optimization of Thickening Efficiency**

# S-Flow VI20I

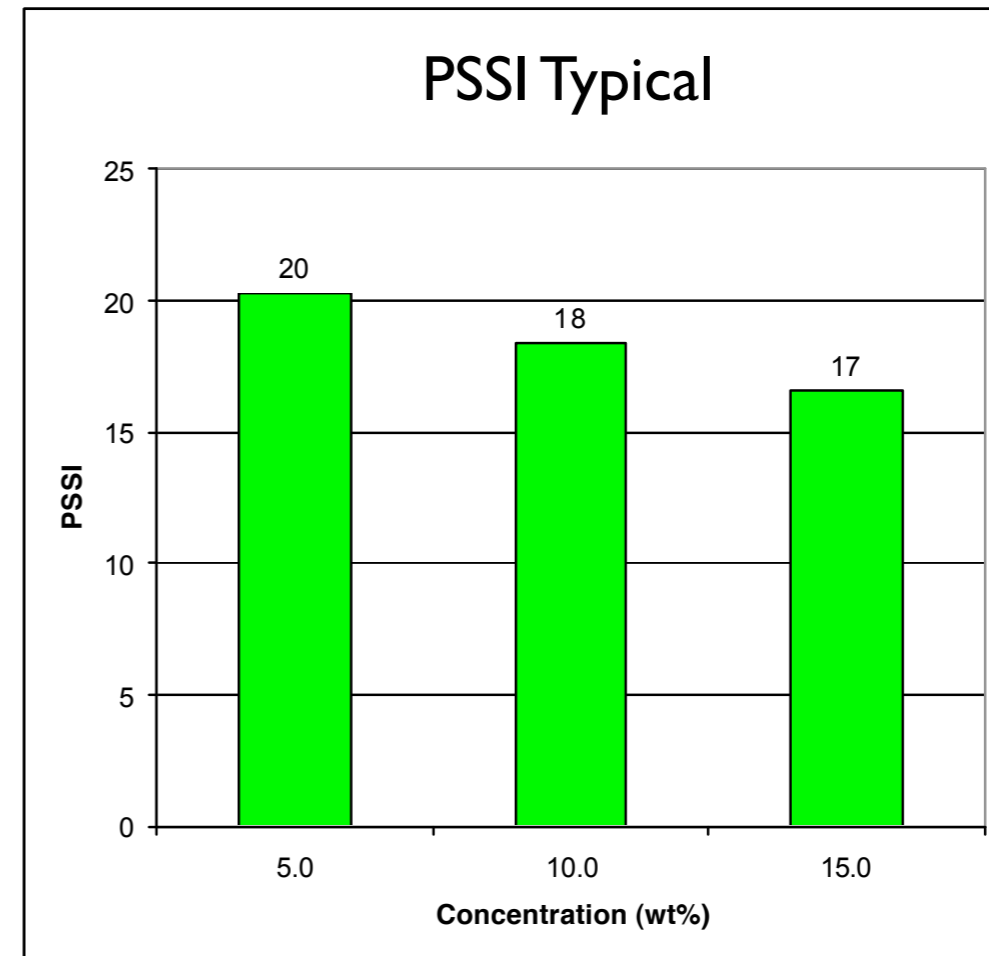
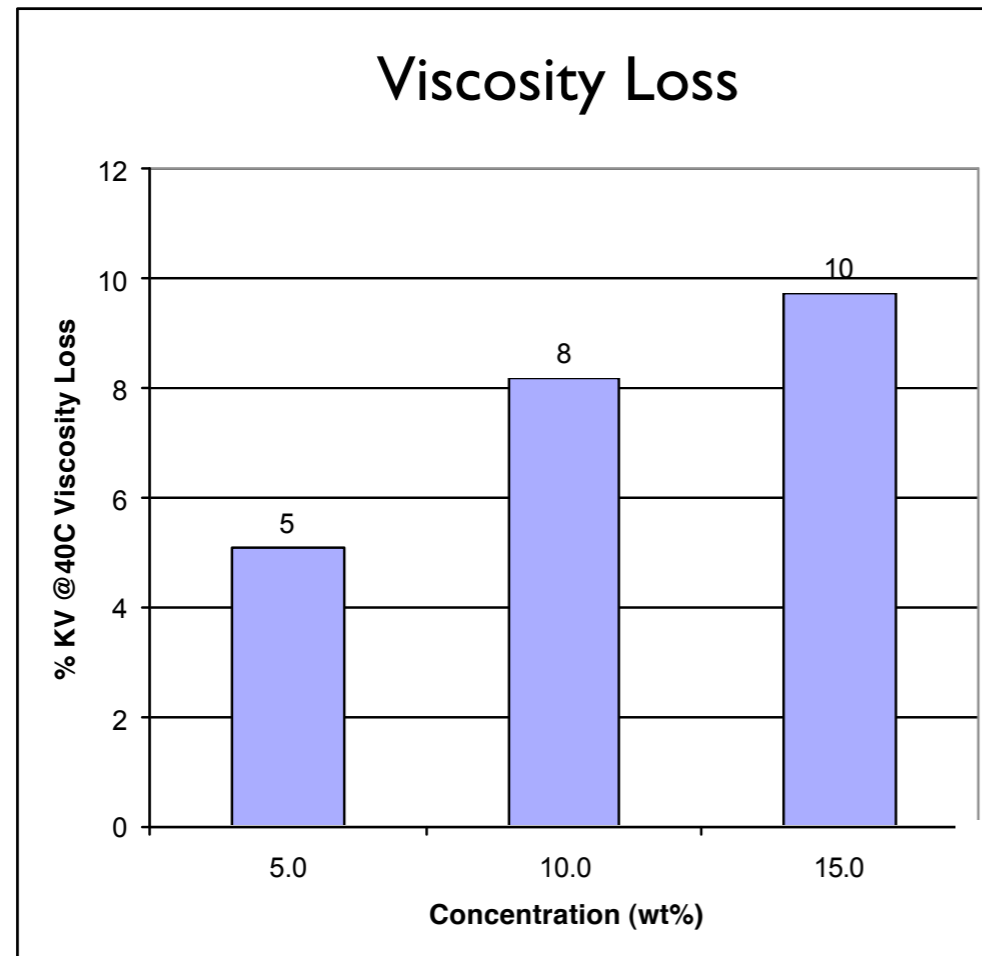
## Viscosity Index in Group I Base Oil



## Improvement in Viscosity Index (VI)

# S-Flow VI20I

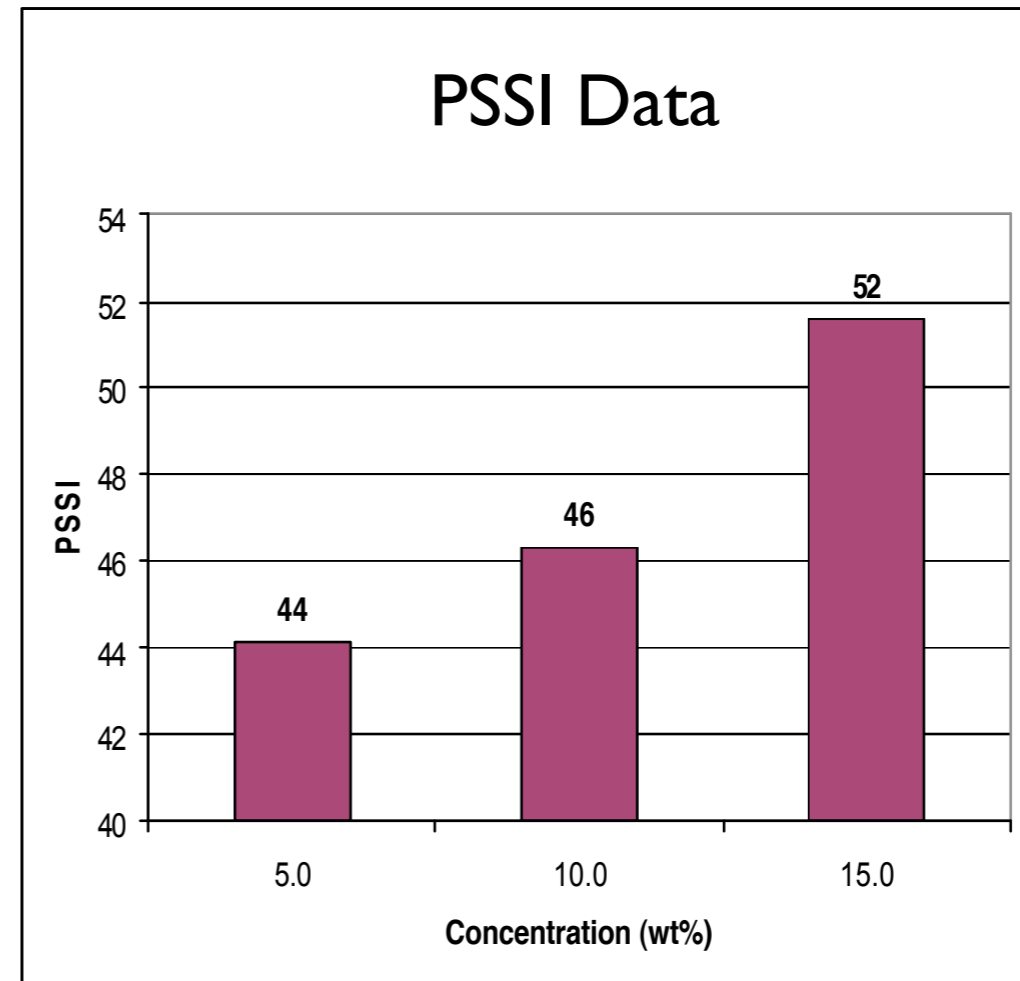
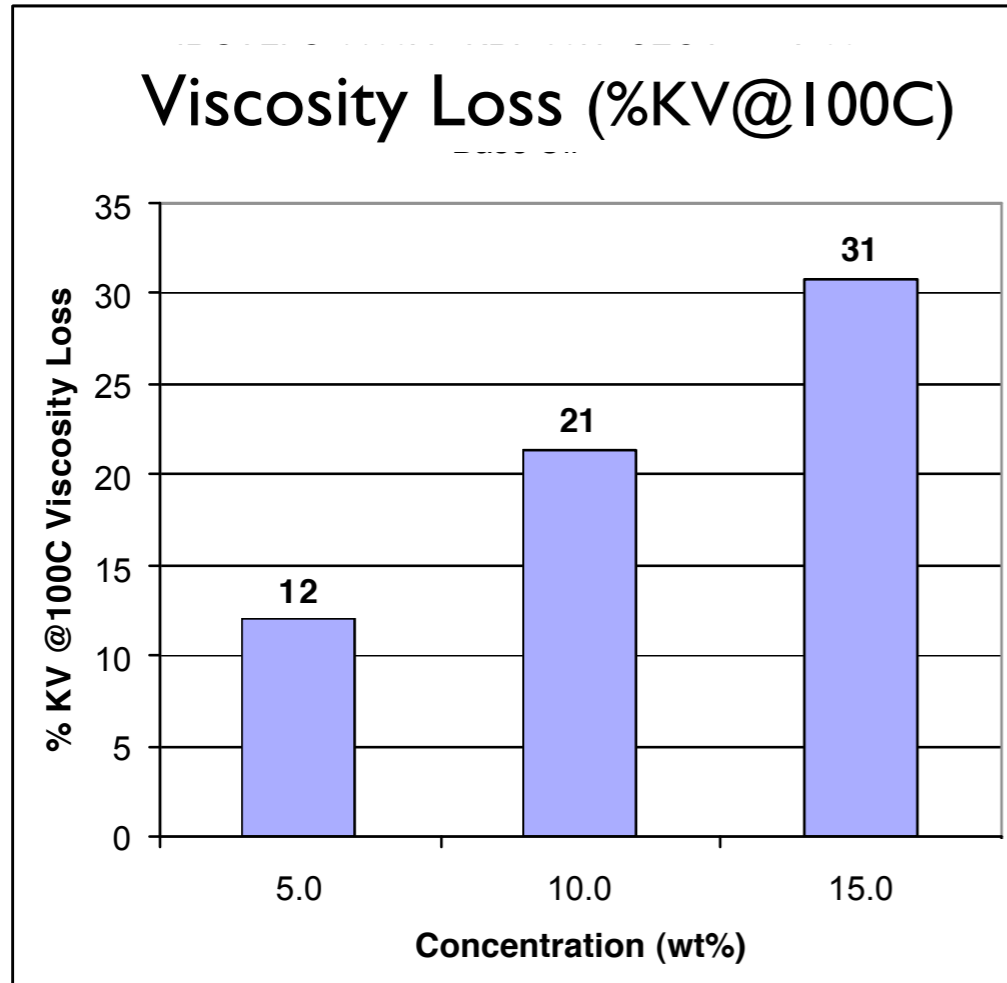
Sonic Shear (ASTM D-562I) in Group I Base Oil (150N)



Shear Stable Typical of Gear Oil Applications

# S-Flow VI20I

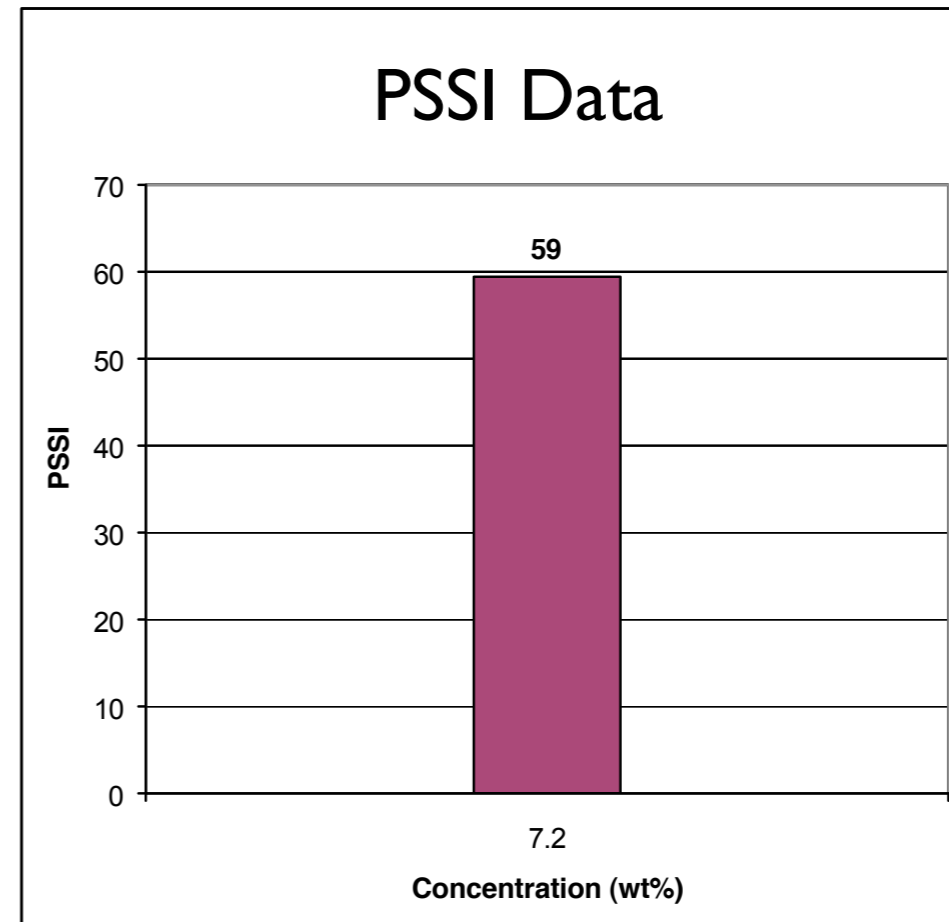
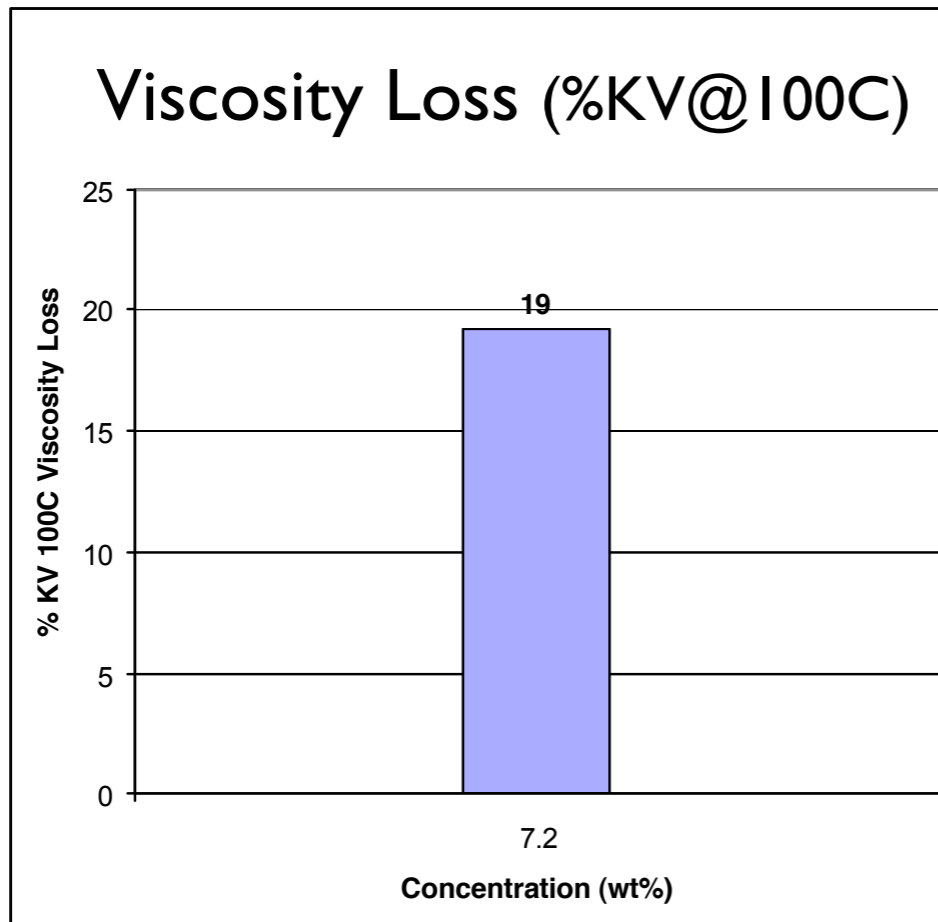
KRL Data 20 Hour (CEC L-45-A-99) in Group I Base Oil (150N)



**Extremely Shear Stable Under Harsh KRL Conditions**

# S-Flow VI20I

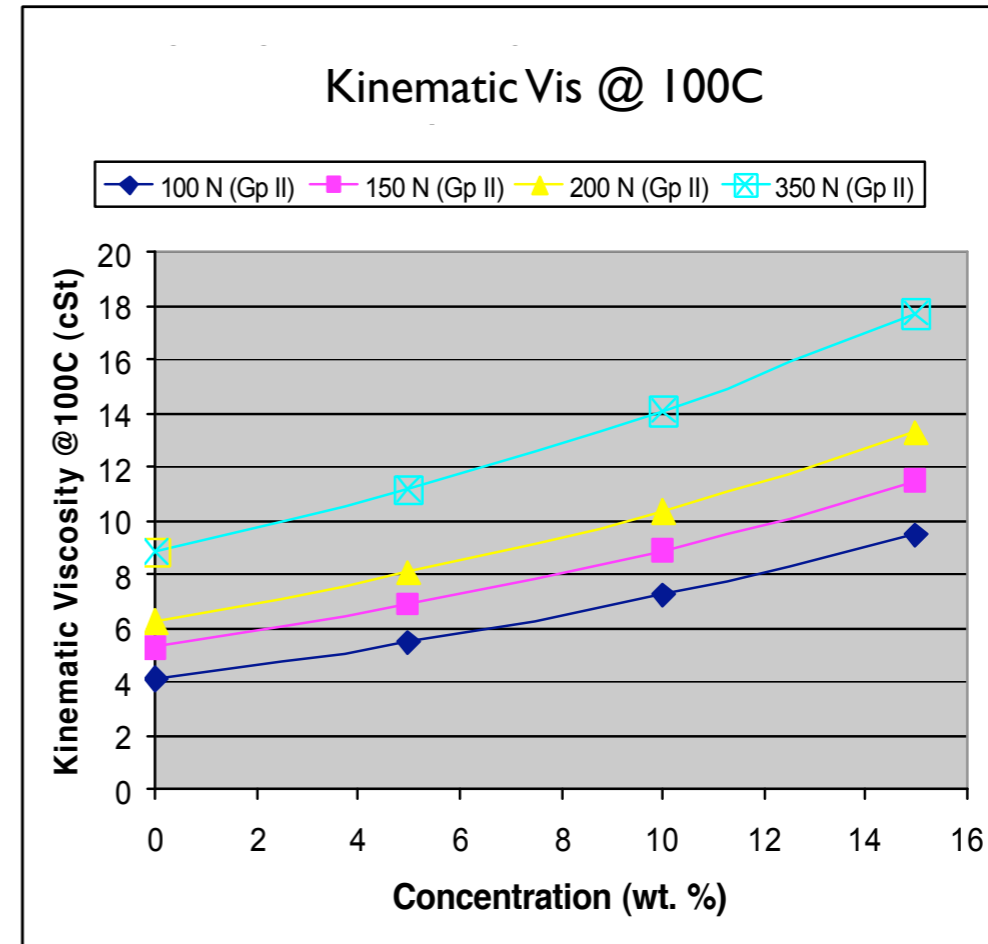
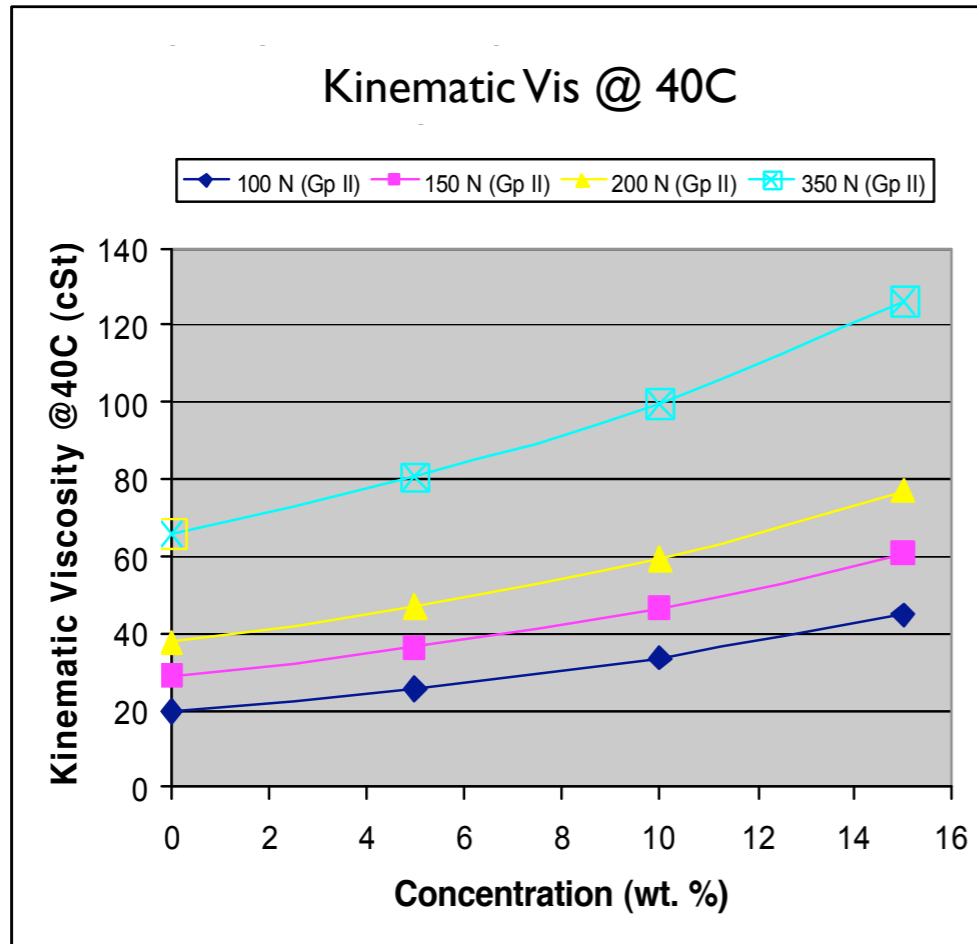
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**Viscometrics Stay in Grade for Longer**

# S-Flow VI20I

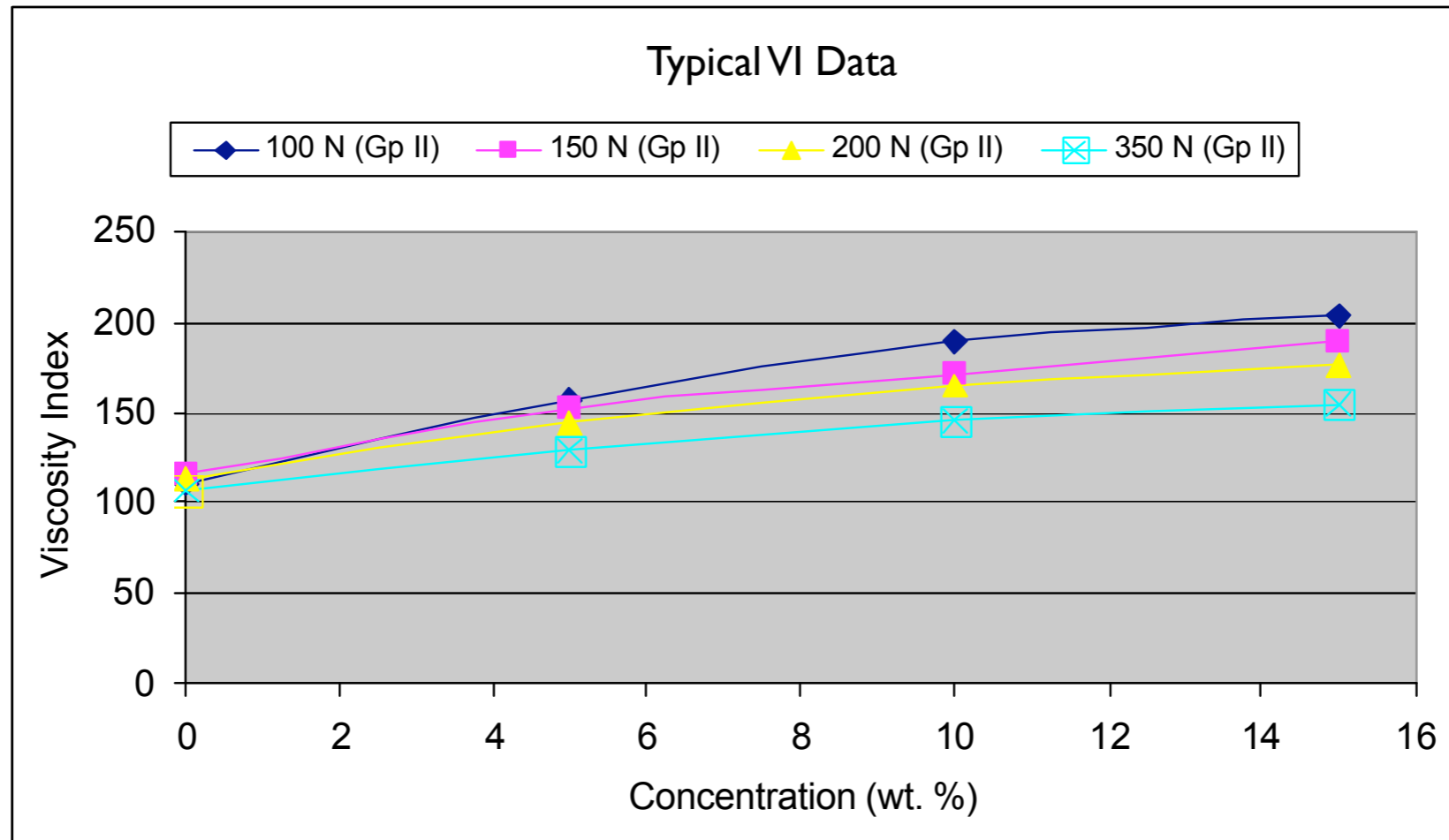
## Typical Thickening in Group II Base Oil



**Optimization of Thickening Efficiency**

# S-Flow VI201

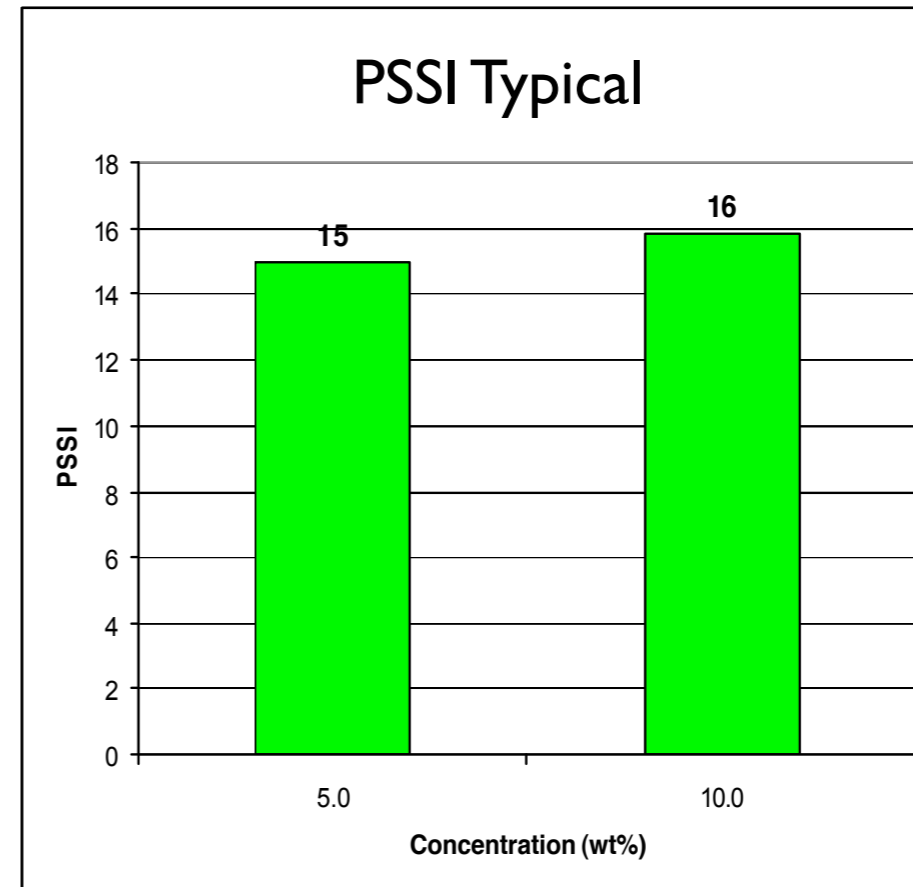
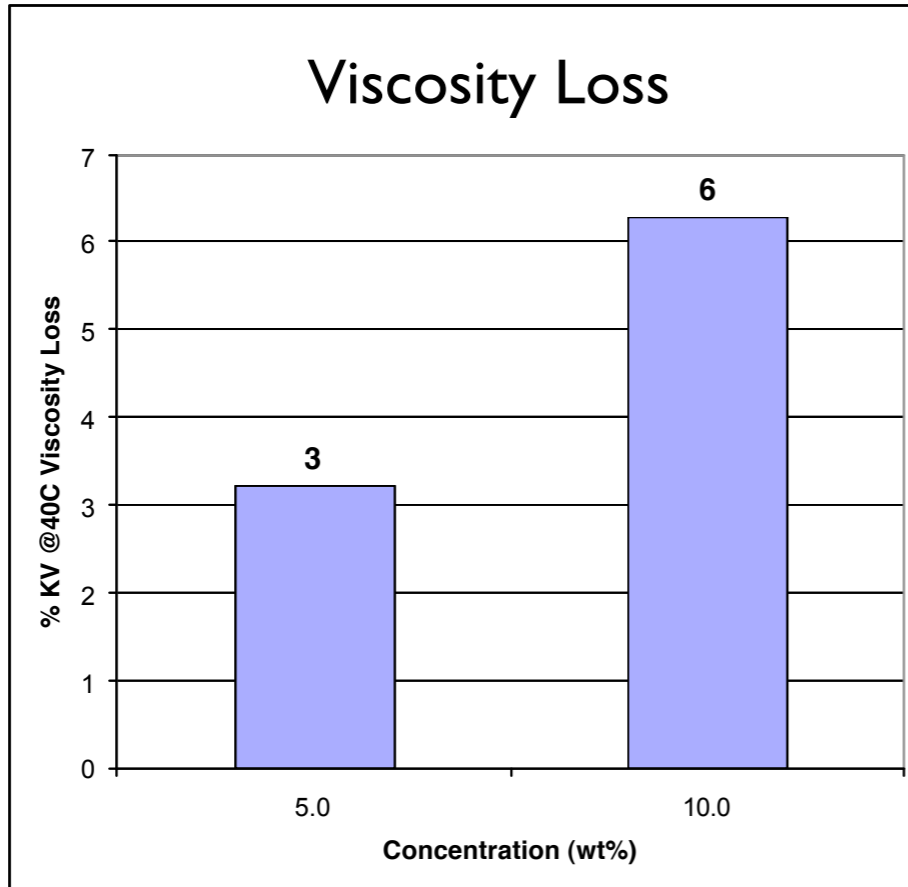
## Viscosity Index in Group II Base Oil



## Improvement in Viscosity Index (VI)

# S-Flow VI20I

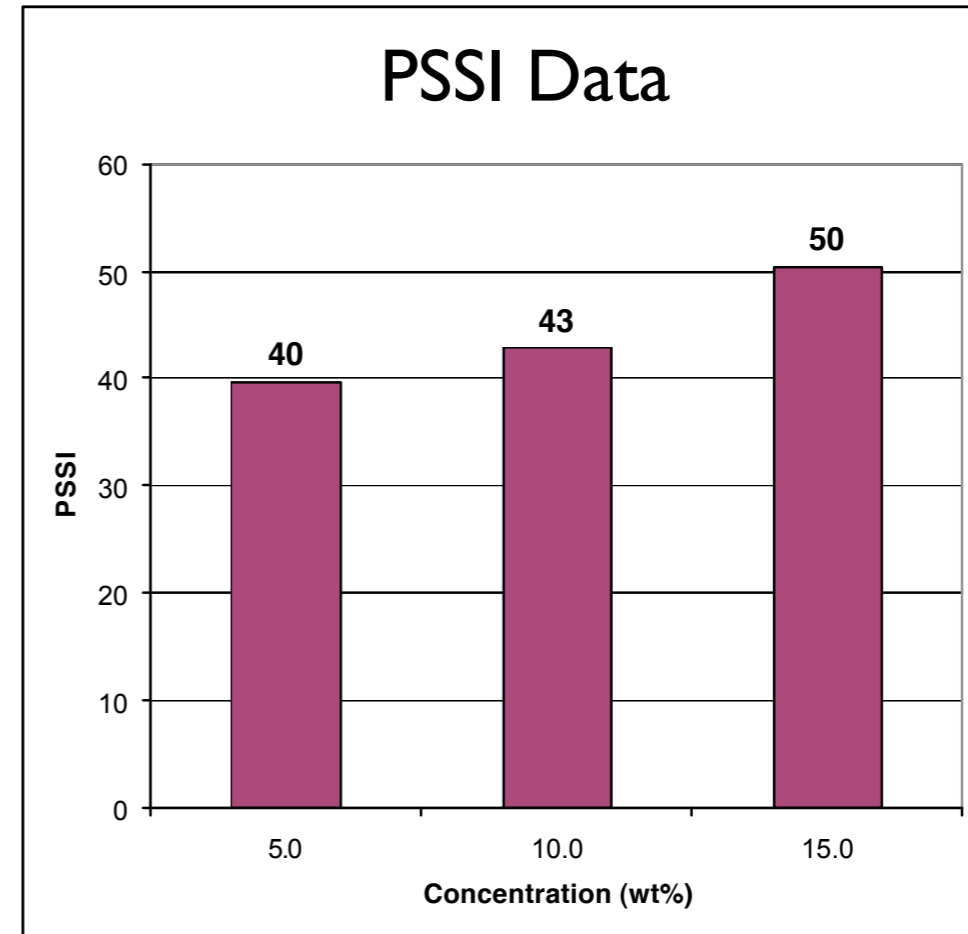
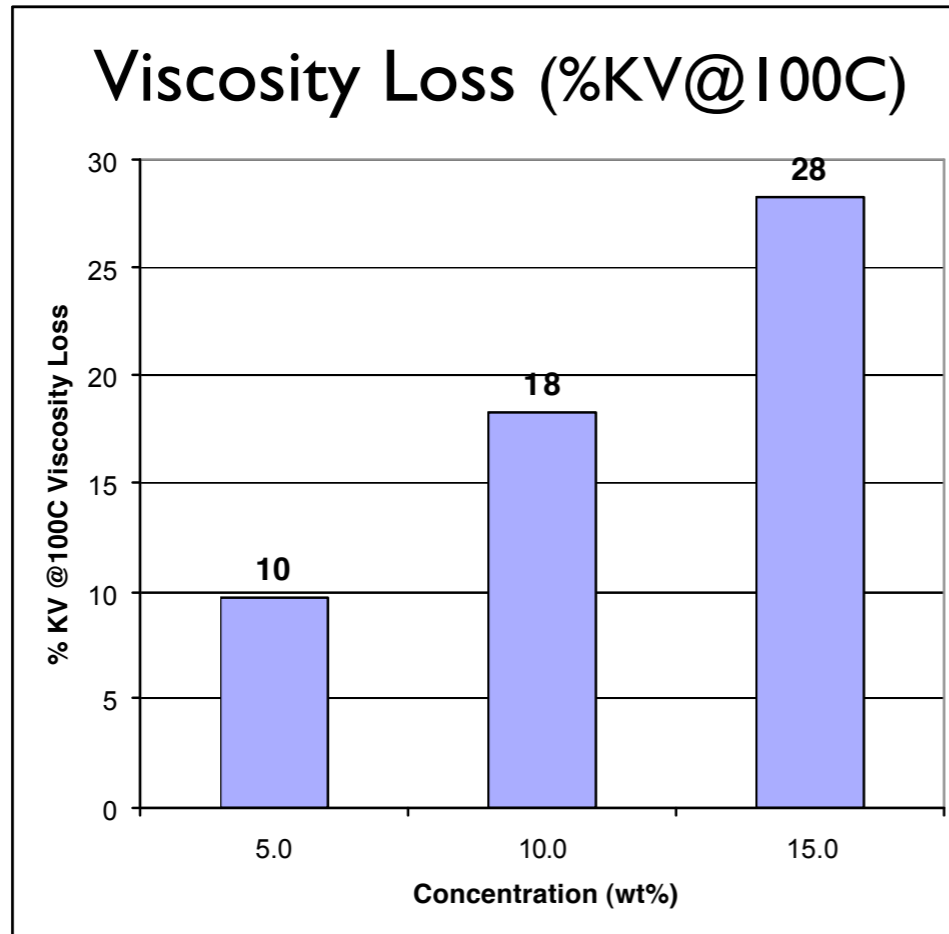
Sonic Shear (ASTM D-562I) in Group II Base Oil (150N)



Shear Stable Typical of Gear Oil Applications

# S-Flow VI20I

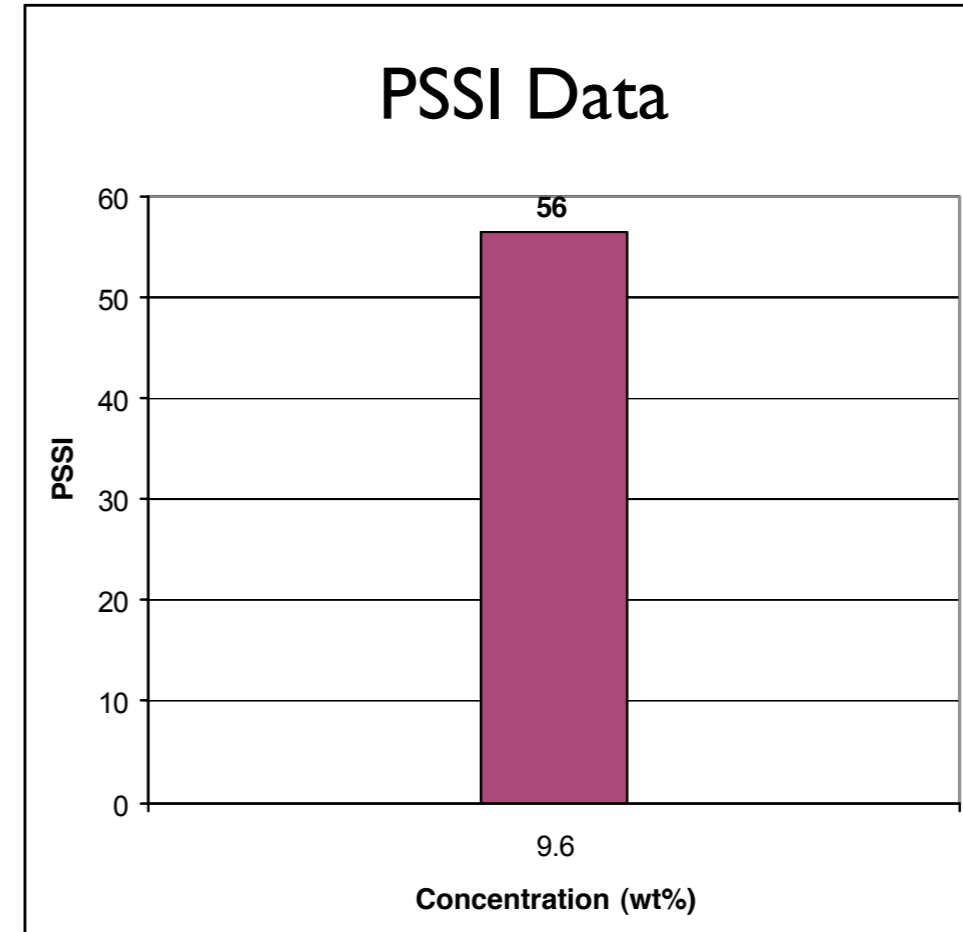
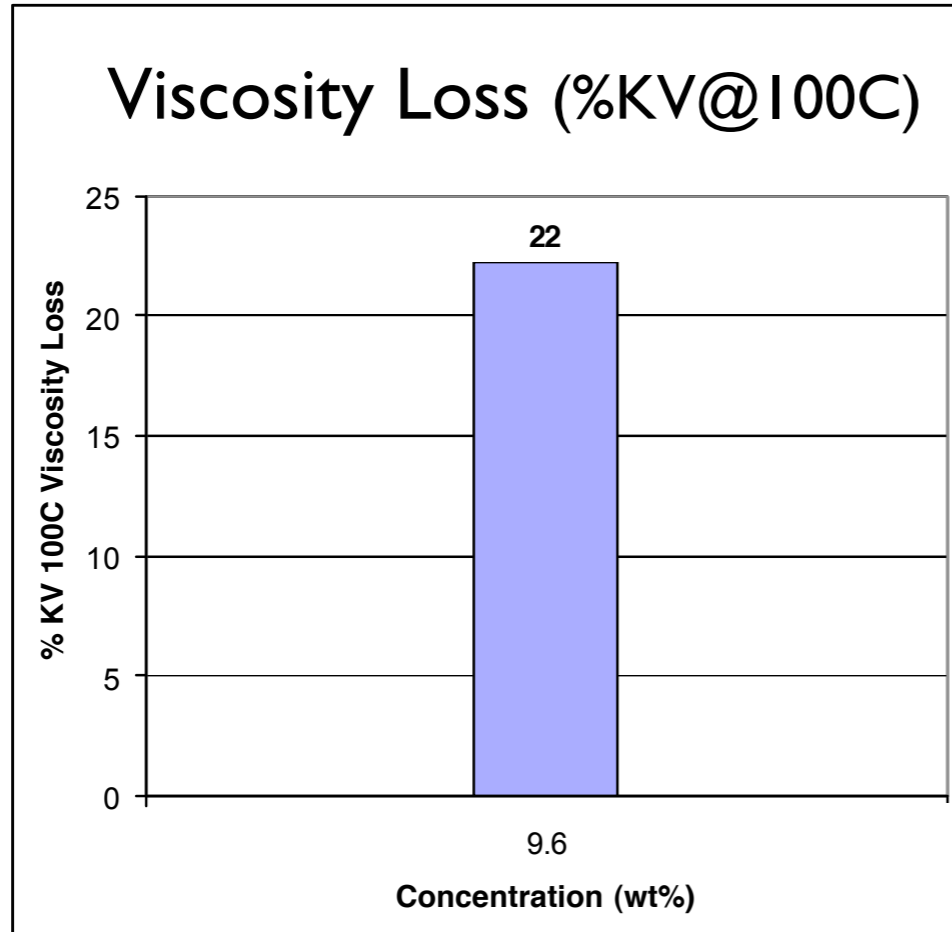
KRL Data 20 Hour (CEC L-45-A-99) in Group II Base Oil (150N)



**Extremely Shear Stable Under Harsh KRL Conditions**

# S-Flow VI20I

KRL Data 20 Hour (CEC L-45-A-99) in Group II Base Oil (150N)



**Viscometrics Stay in Grade for Longer**

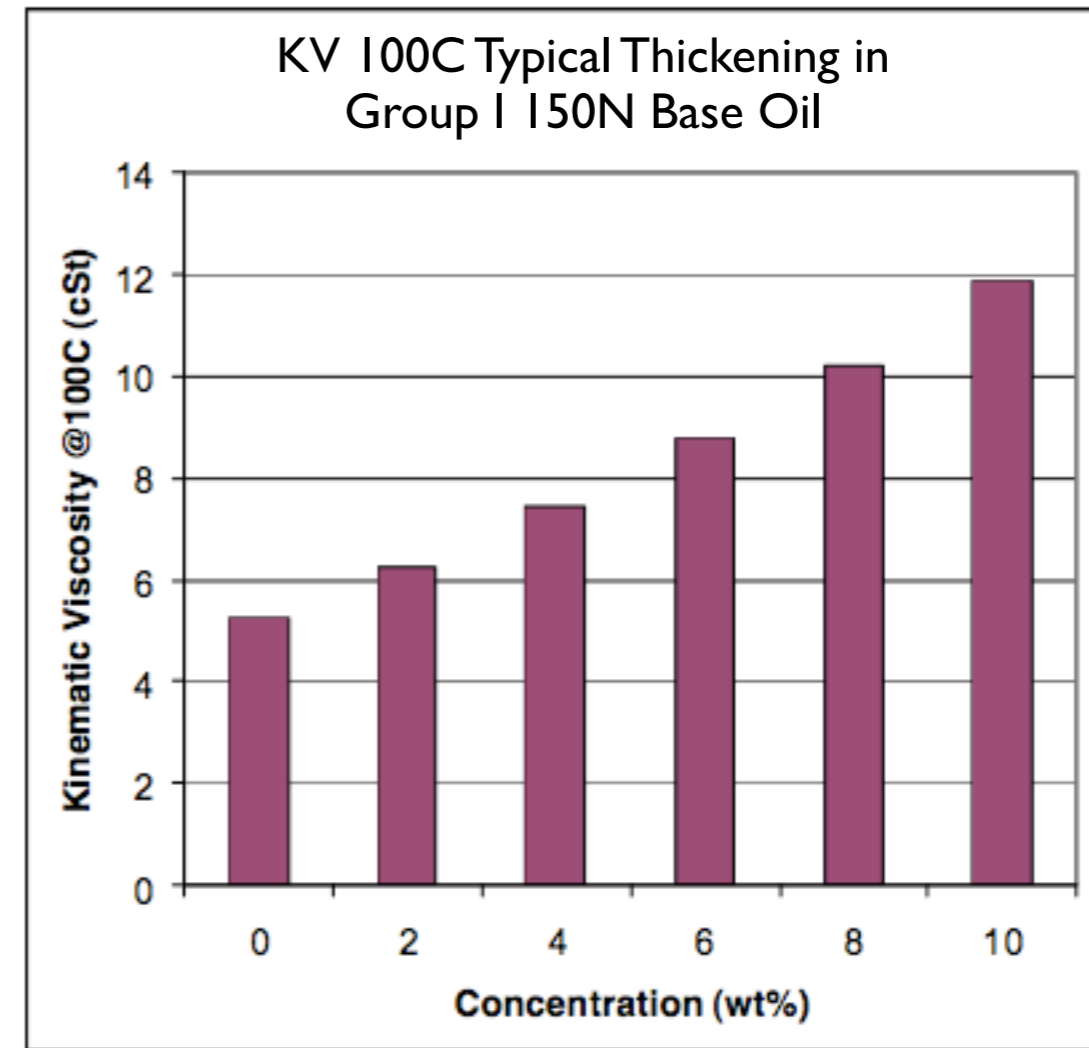
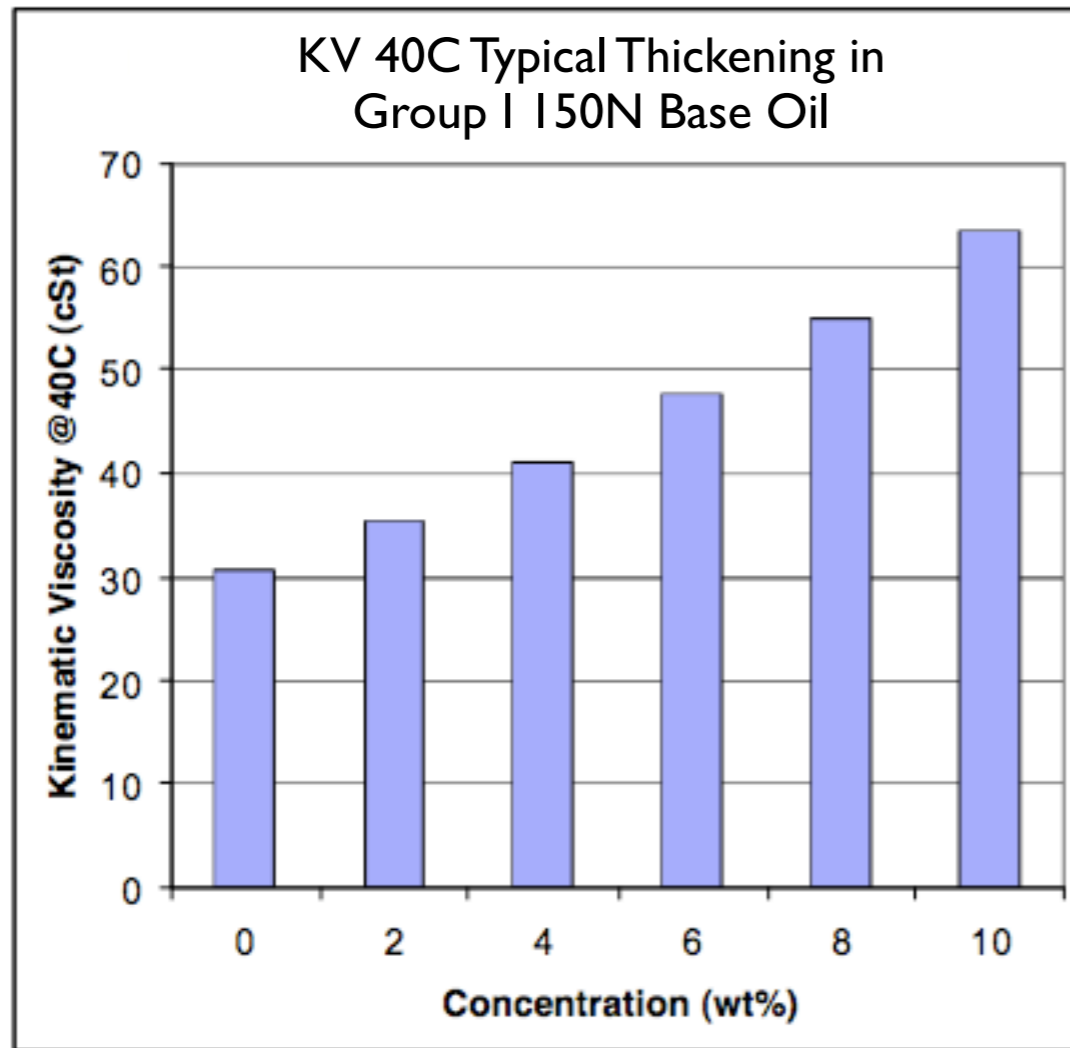
# Summary

## VI20I Shear Stable Viscosity Modifier

- S-Flow VI20I is designed for high shear applications
- Pre and post viscosity index highlights VI20I does not readily shear and maintains performance during continual use
- Even under harsh KRL 100 hours, VI20I does not shear supporting continued stay in grade during use
- Thickening efficiency is optimized for shear gain

# S-Flow V6200

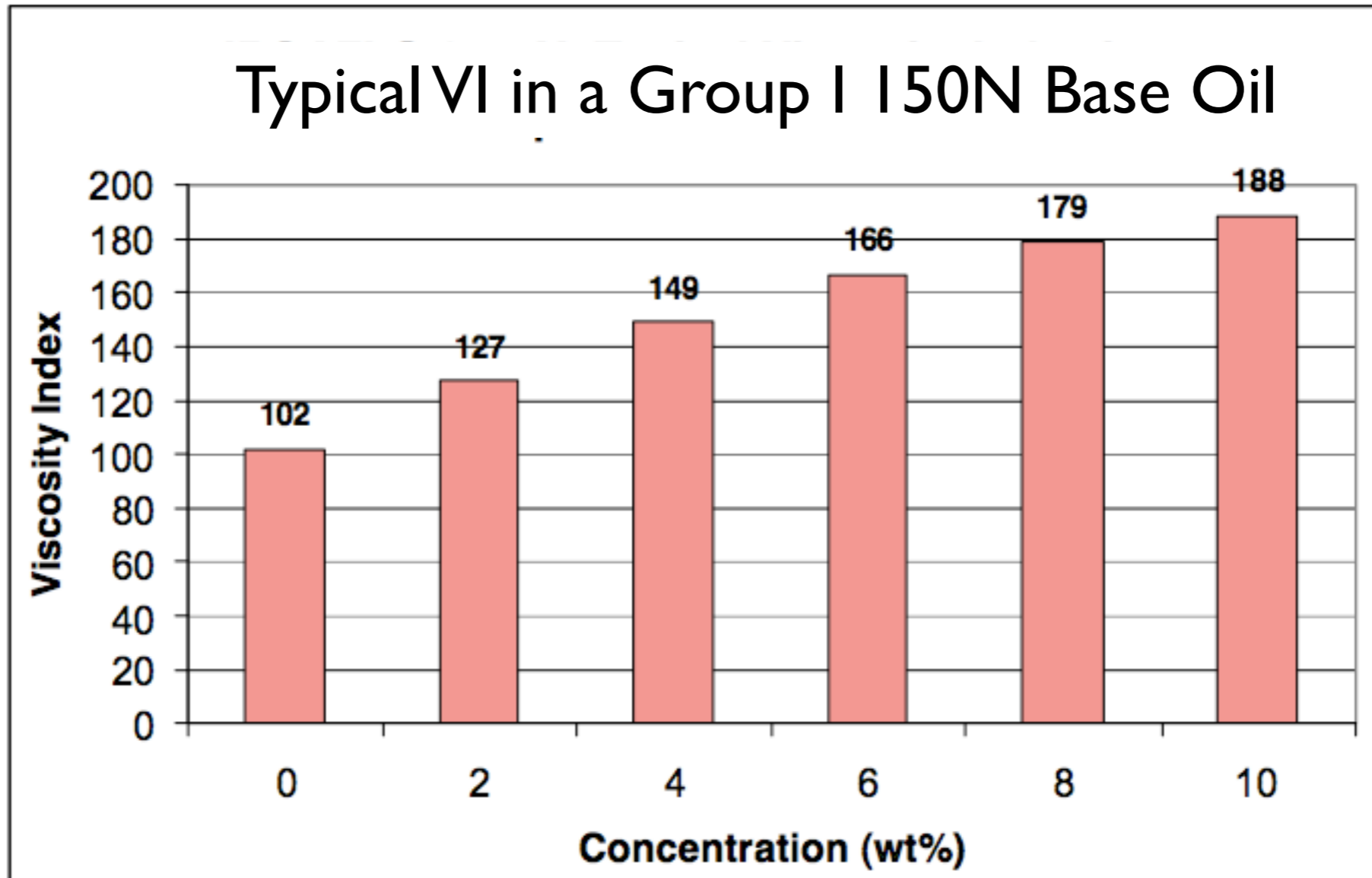
## Thickening Efficiency



## Optimized Thickening Efficiency

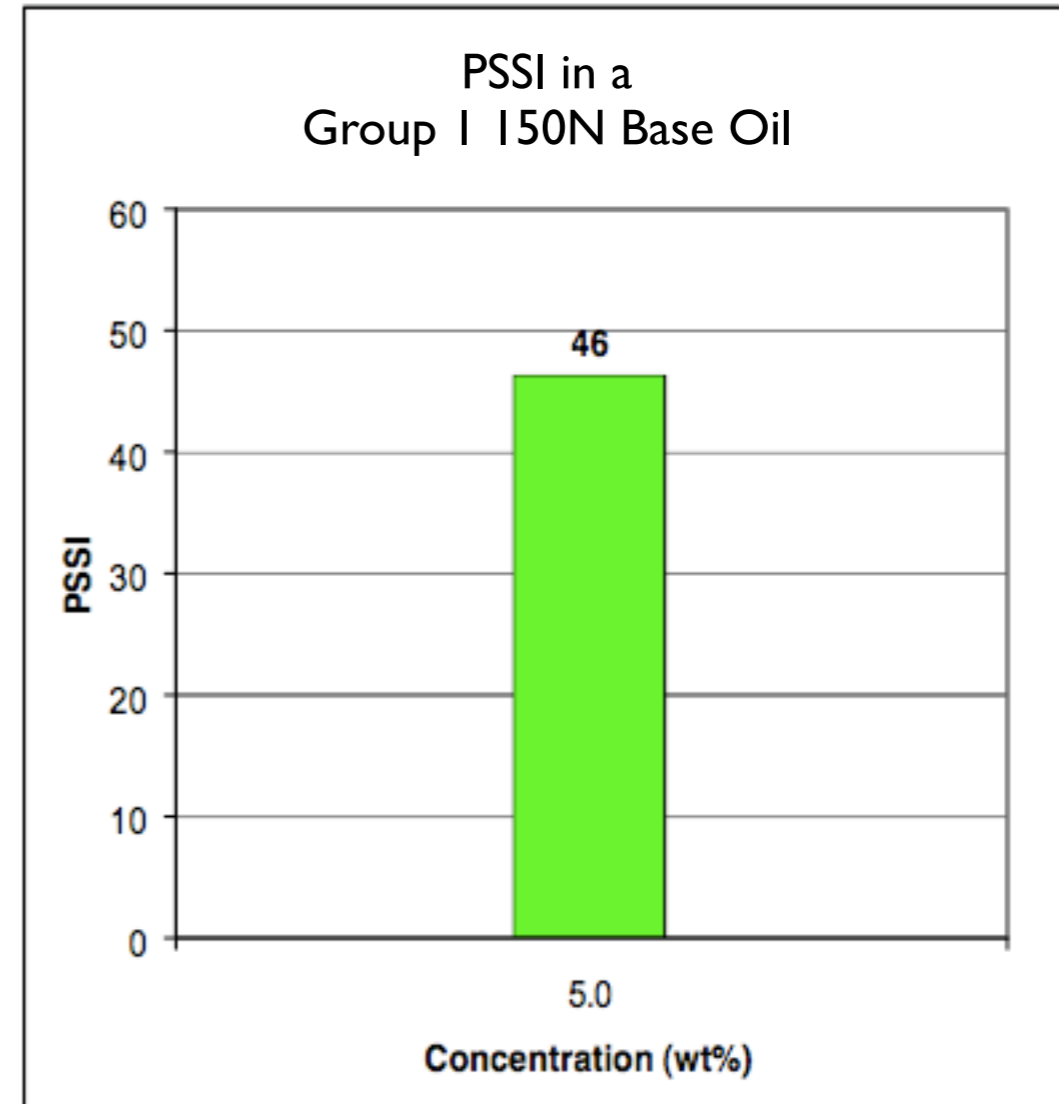
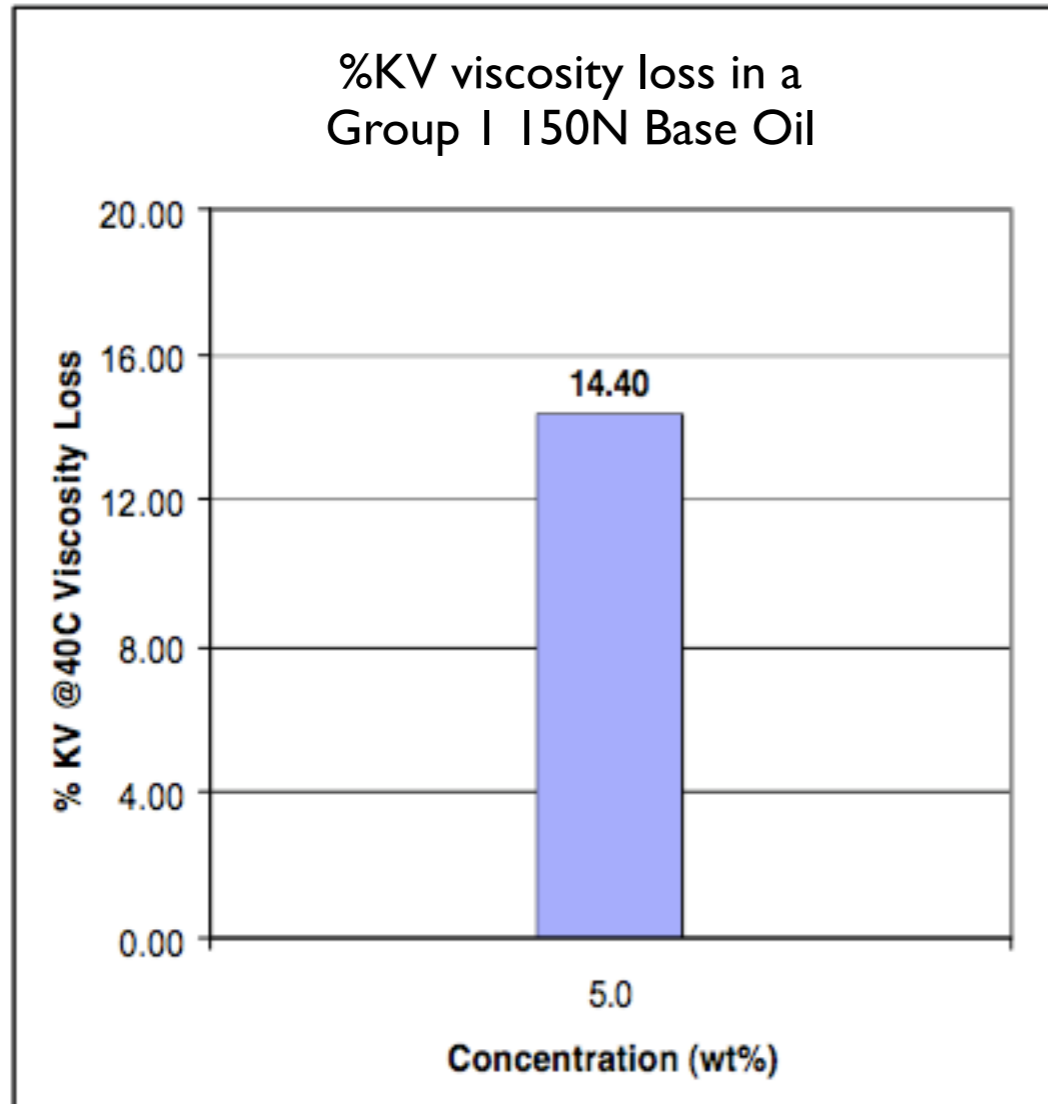
# S-Flow V6200

## Viscosity Index



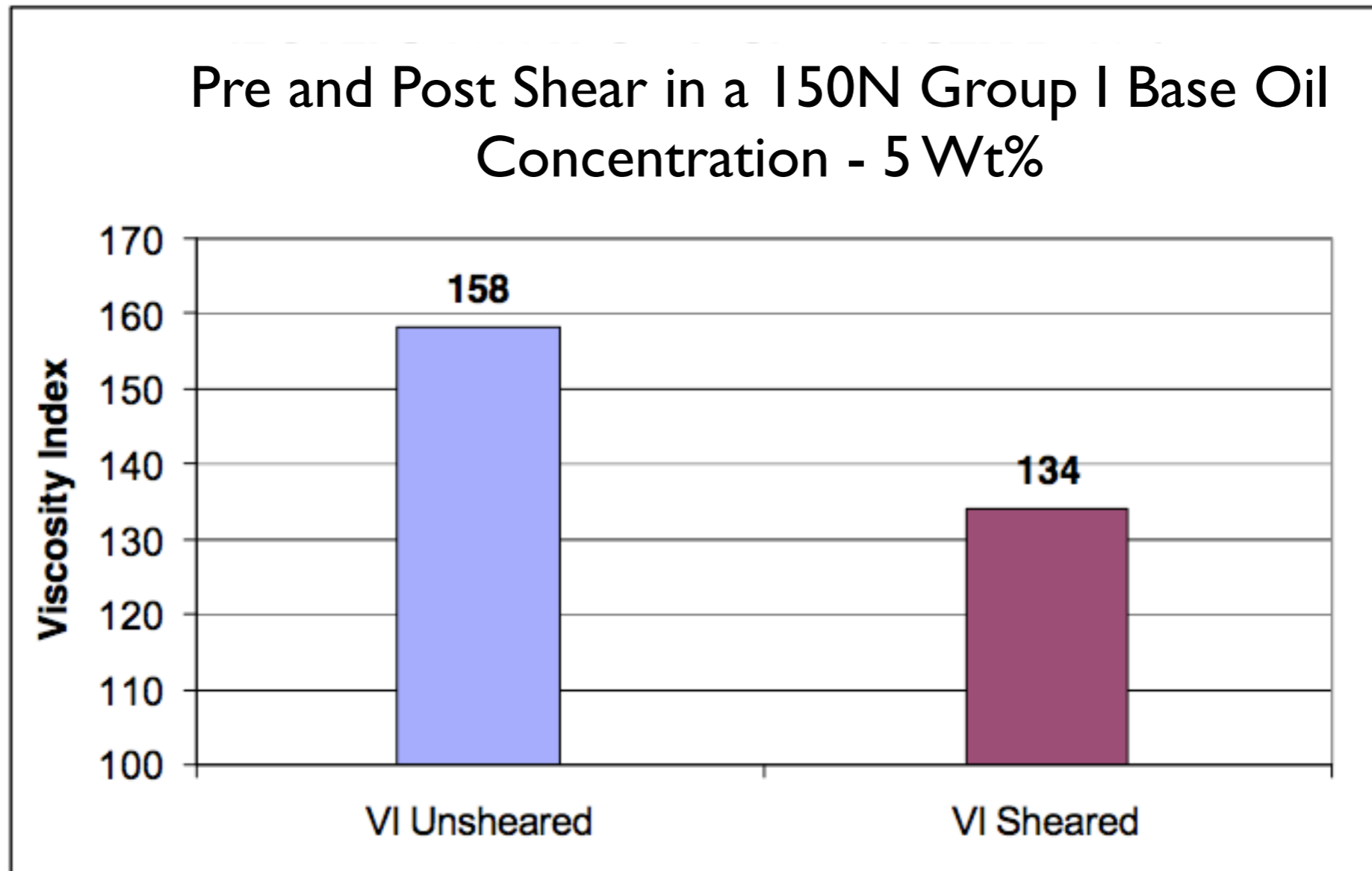
# S-Flow V6200

## Sonic Shear ASTM-562 I



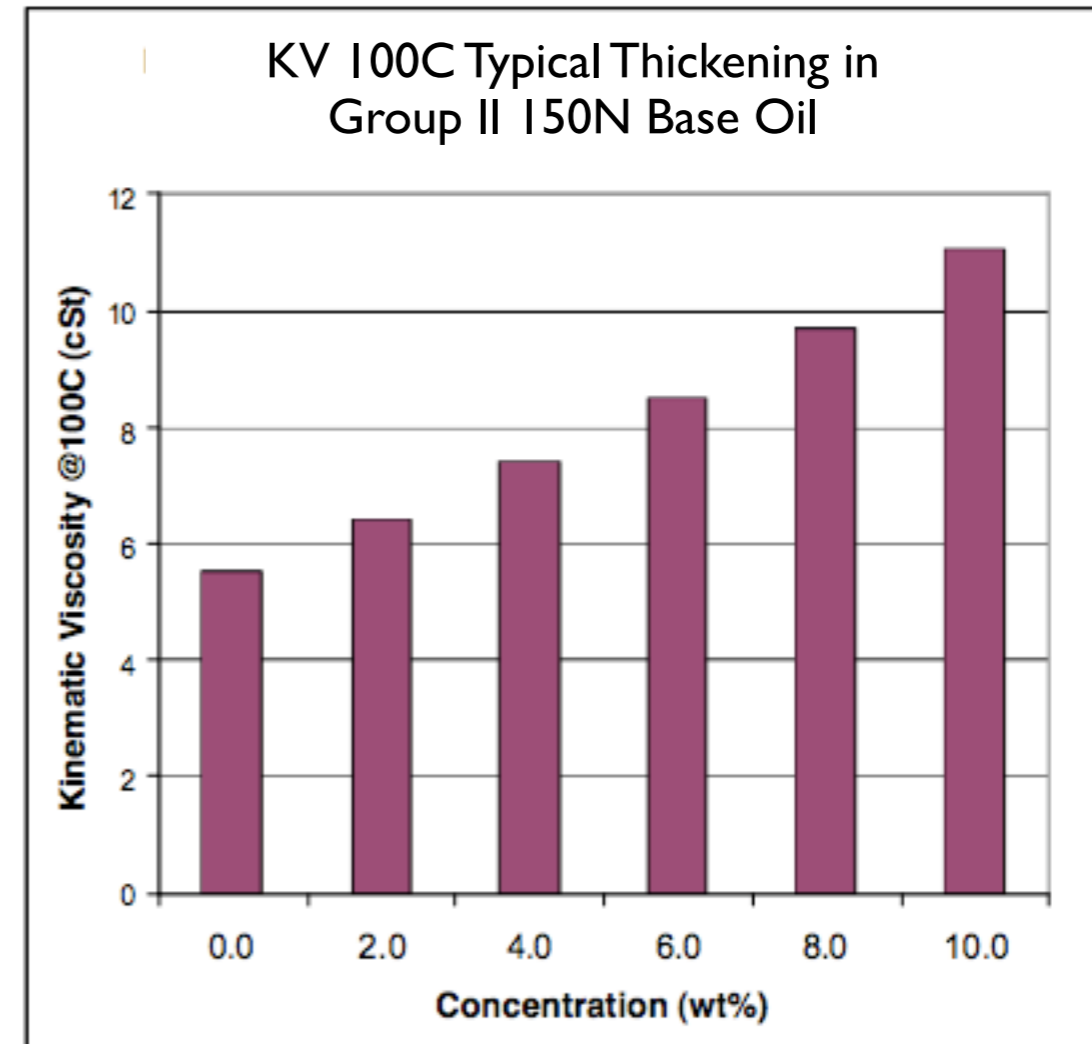
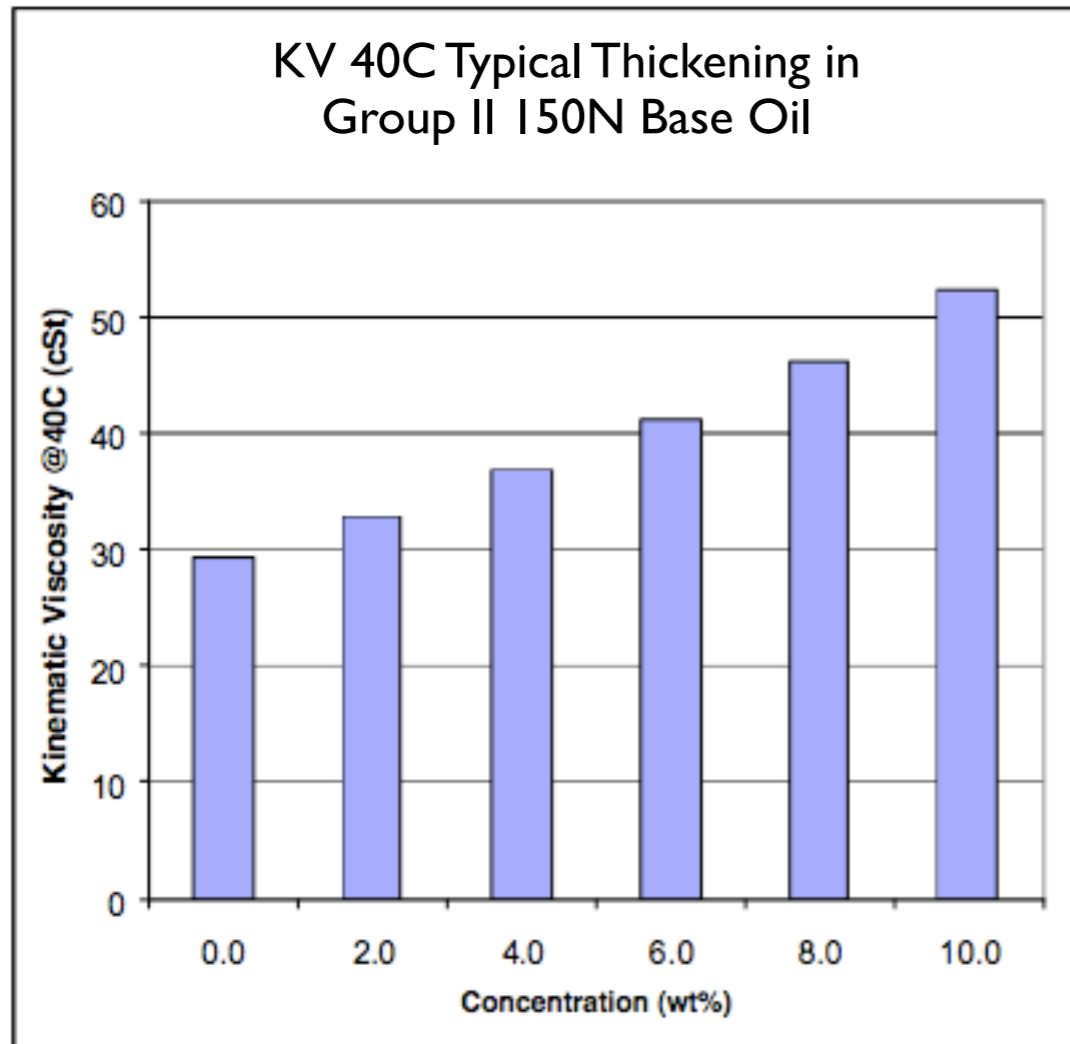
# S-Flow V6200

## Sonic Shear ASTM-562 I



# S-Flow 6200

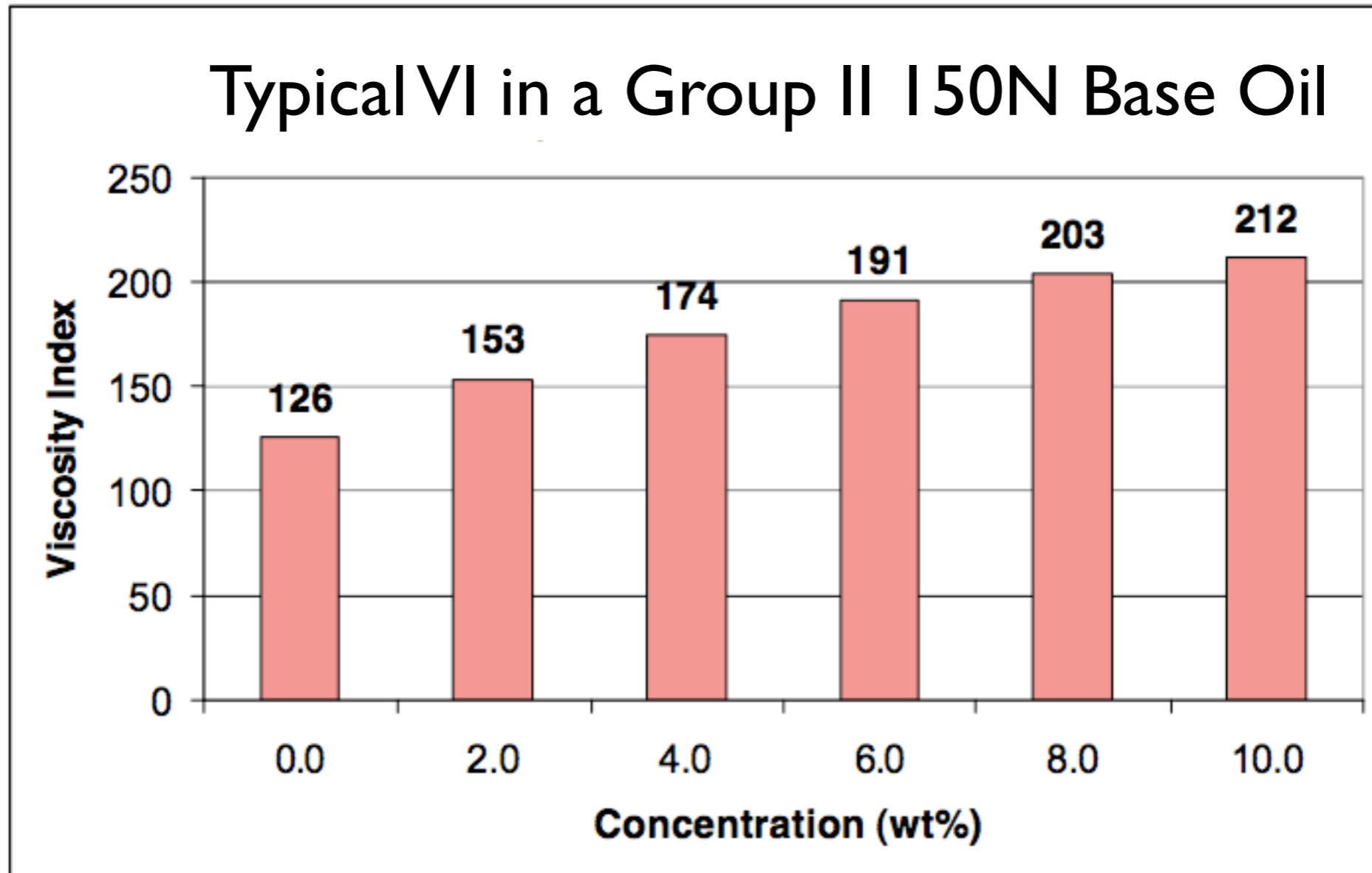
## Thickening Efficiency



## Optimized Thickening Efficiency

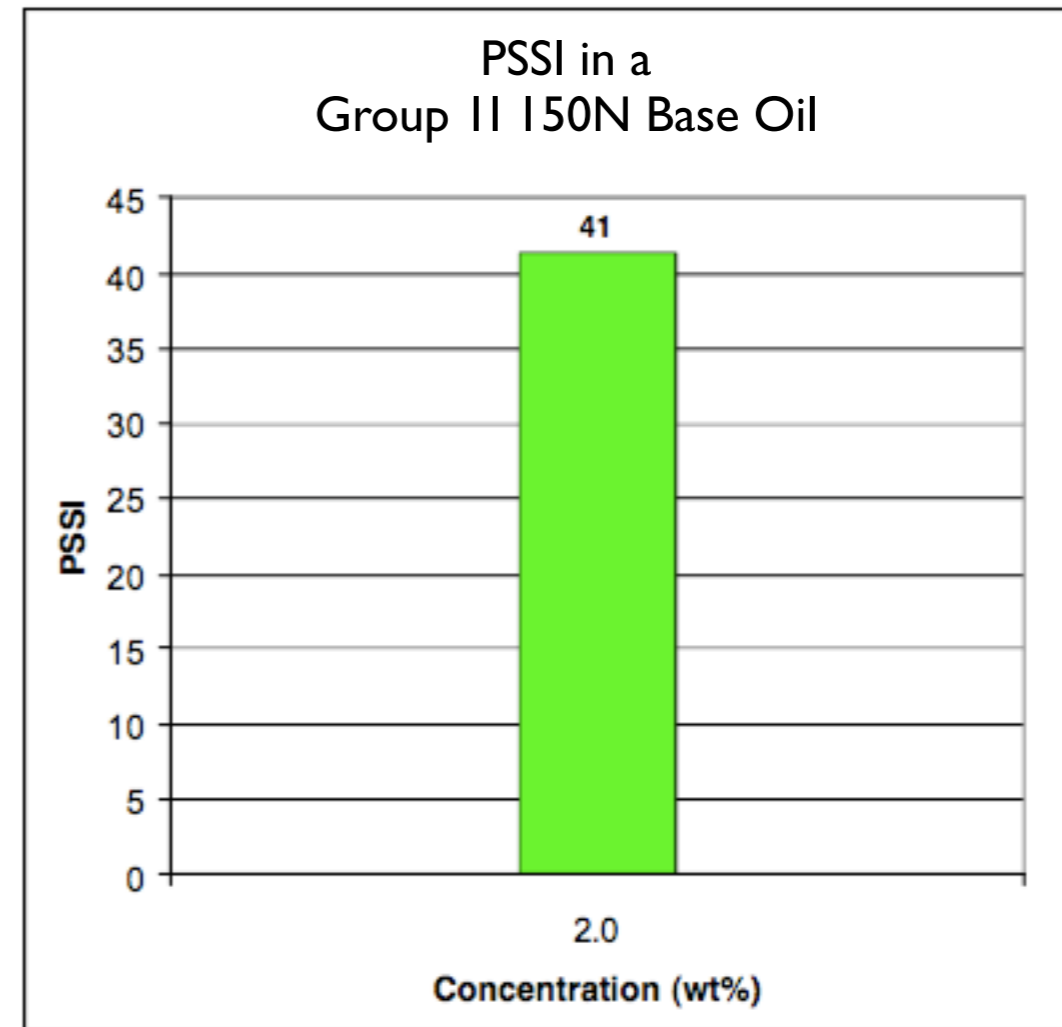
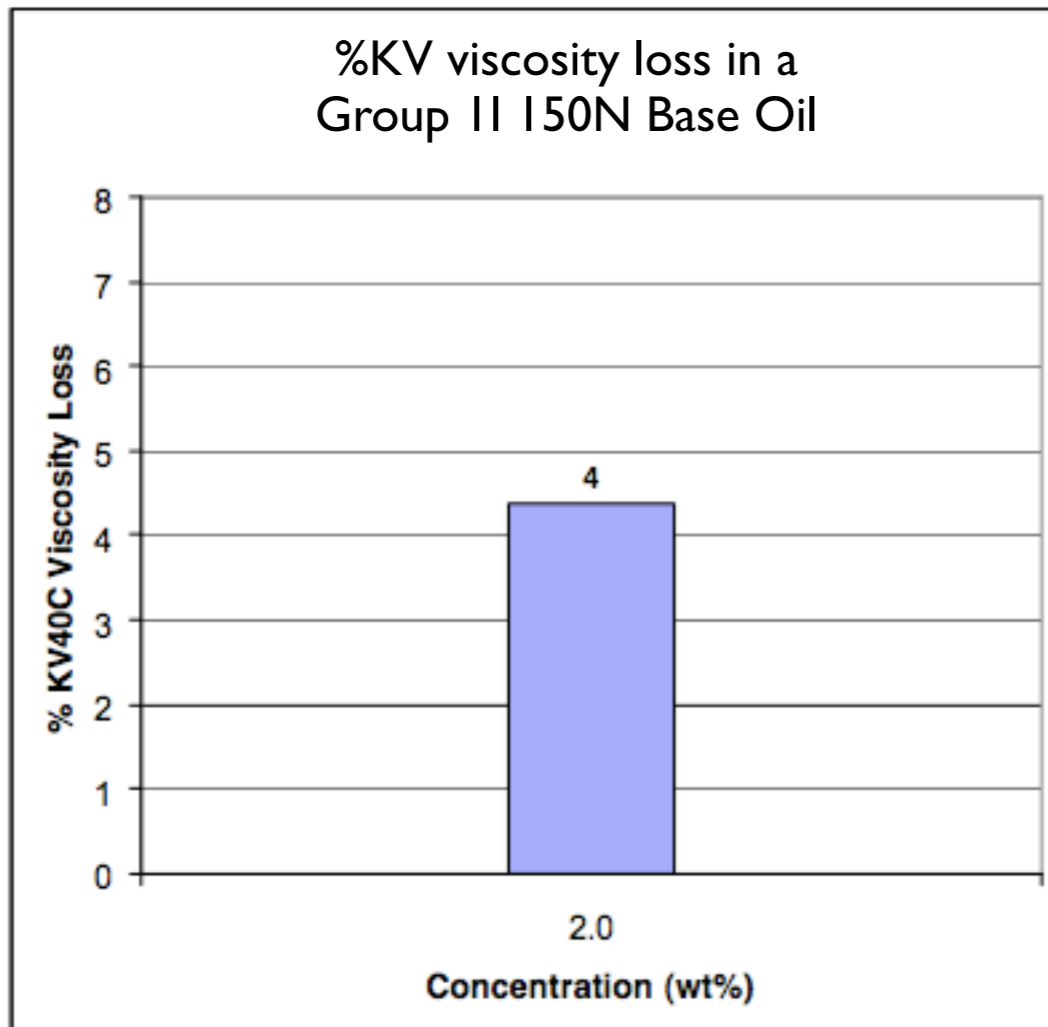
# S-Flow V6200

## Viscosity Index



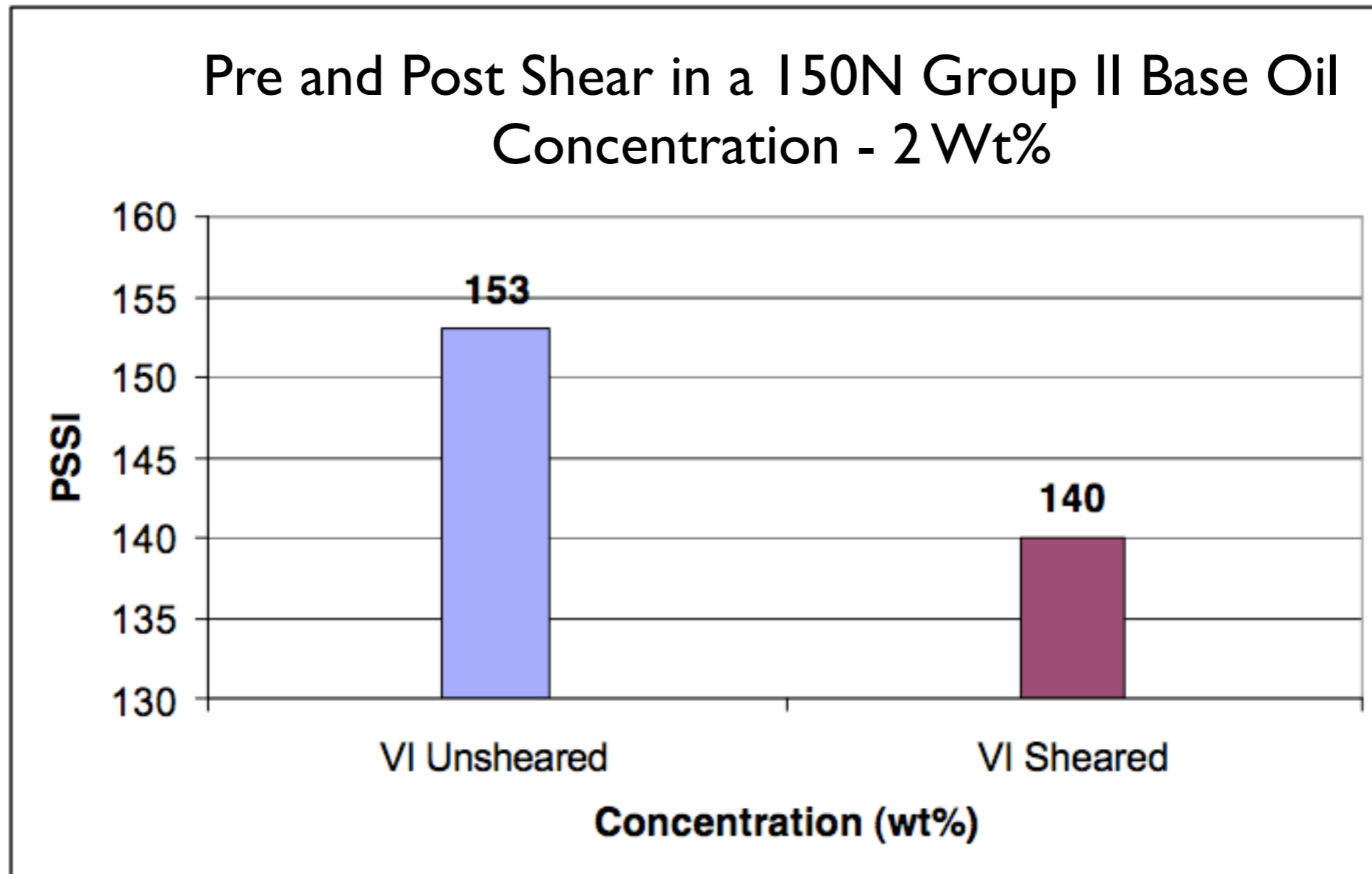
# S-Flow V6200

## Sonic Shear ASTM-562 I



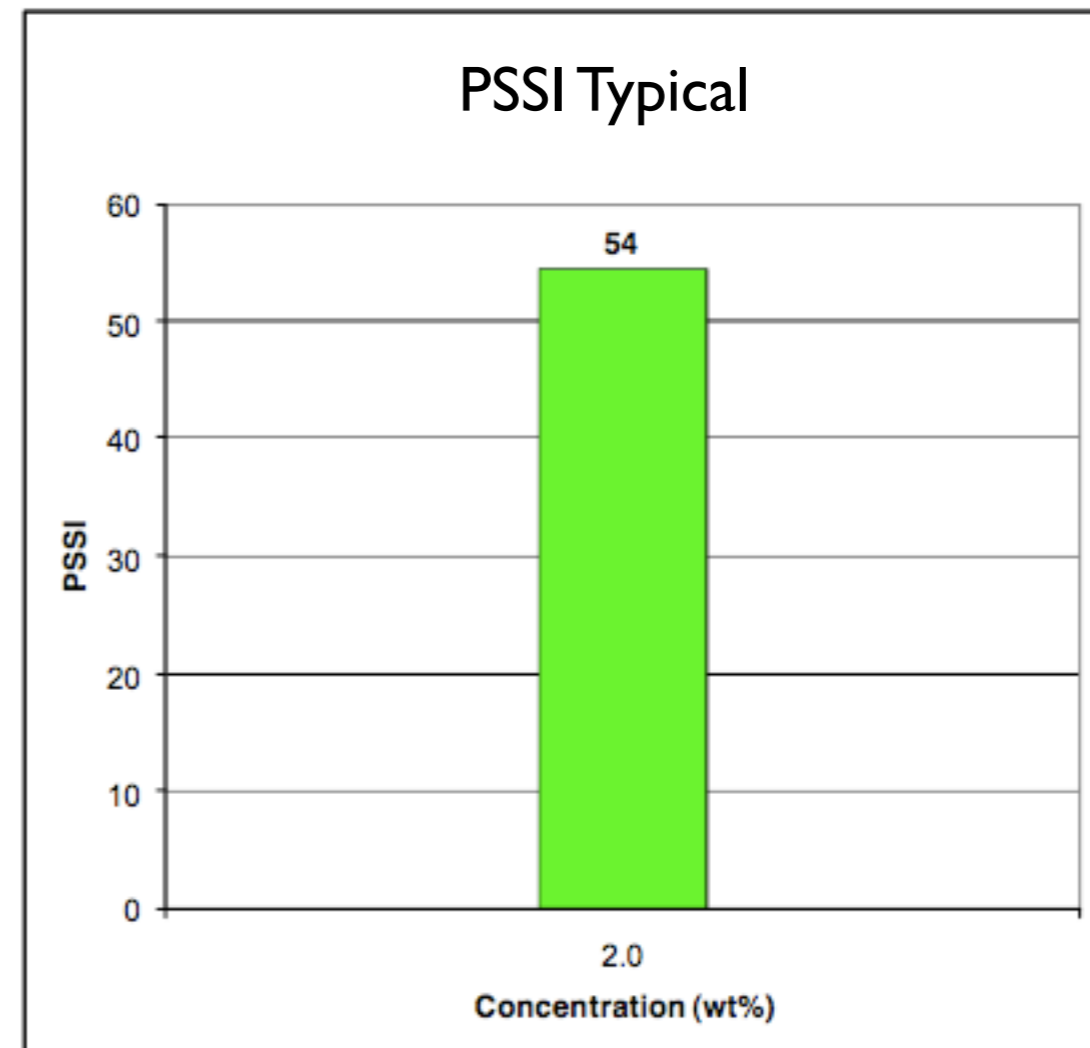
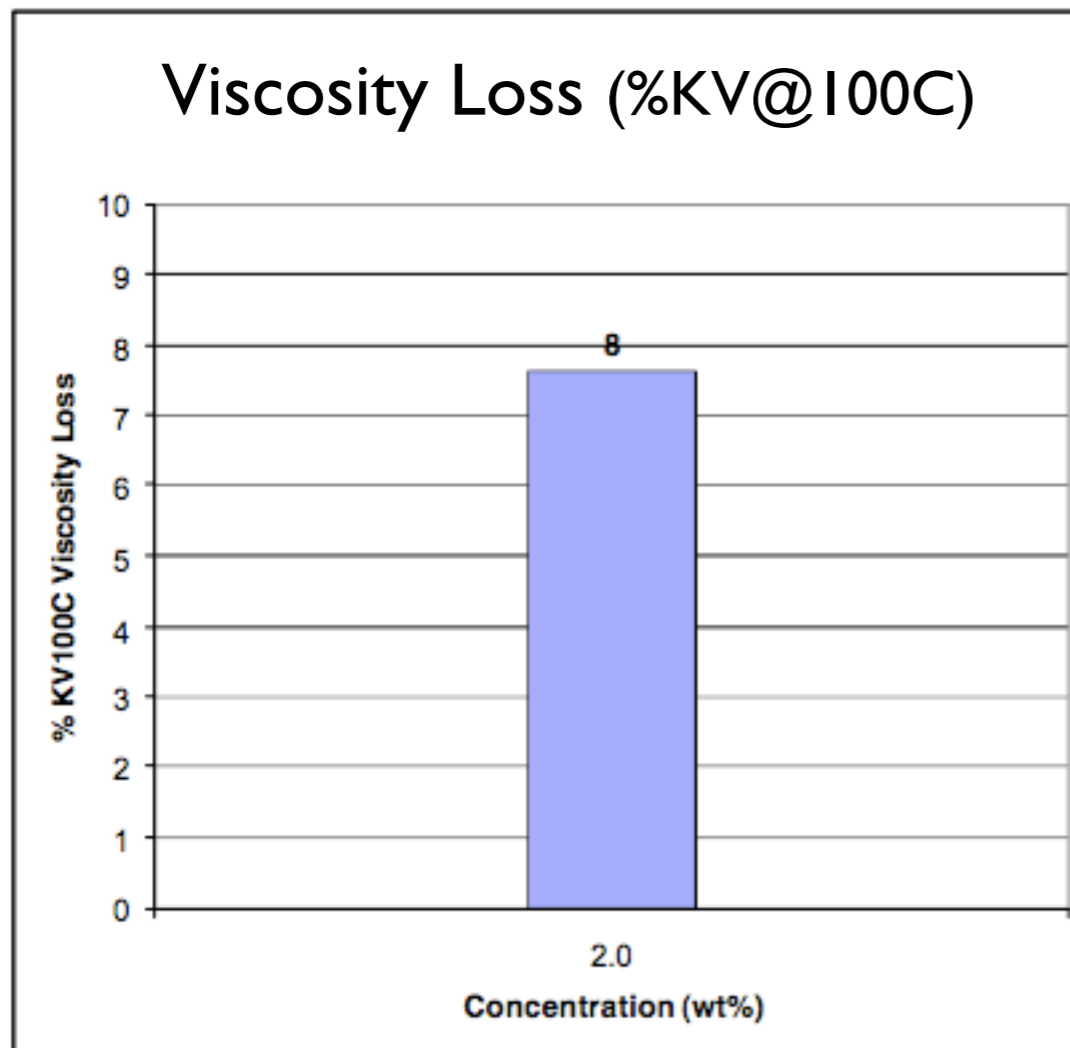
# S-Flow V6200

## Sonic Shear ASTM-562 I



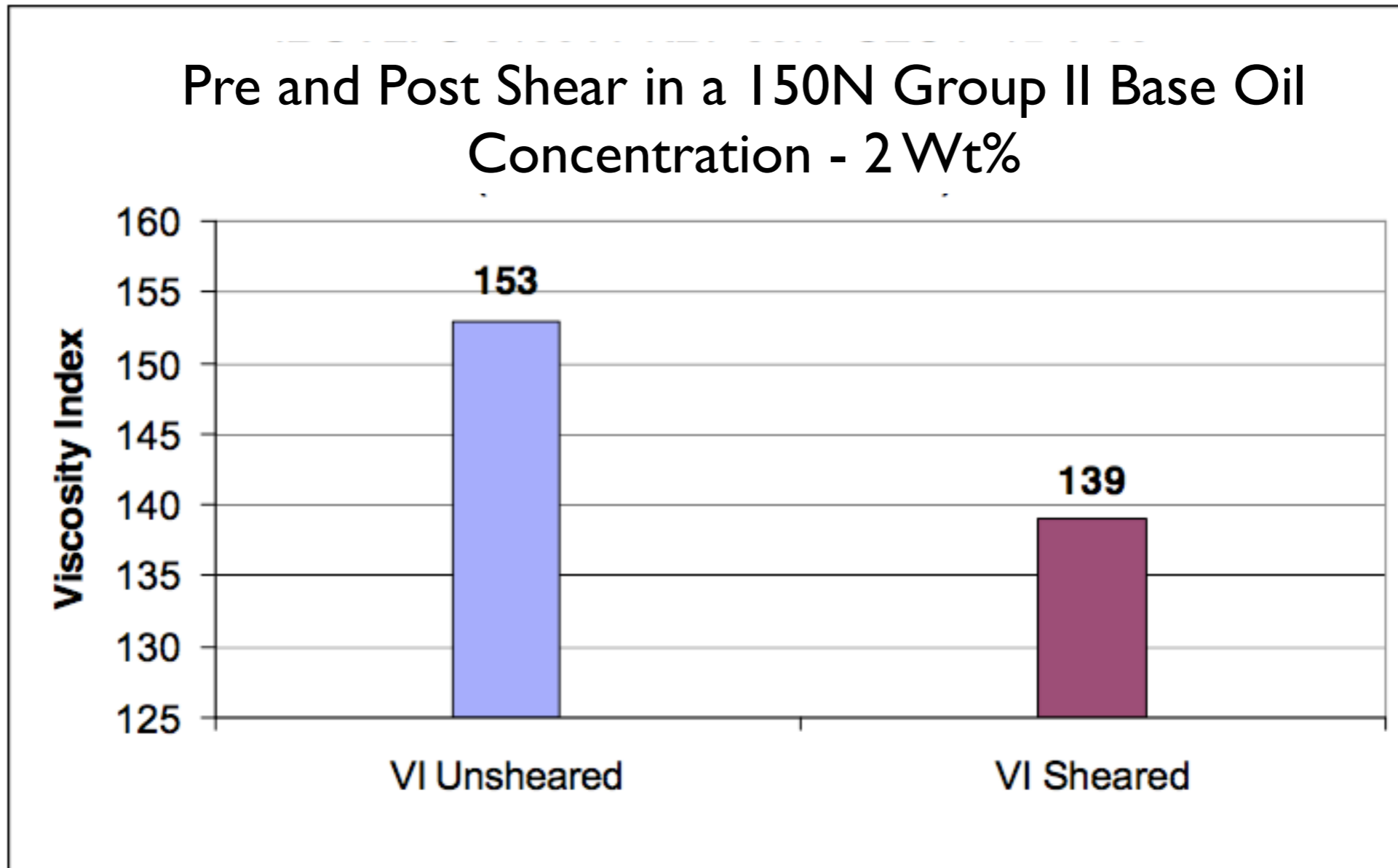
# S-Flow V6200

KRL Data 20 Hour (CEC L-45-A-99) in Group II Base Oil (150N)



# S-Flow V6200

KRL Data 20 Hour (CEC L-45-A-99) in Group II Base Oil (150N)



# Summary

## V6200 Shear Stable Viscosity Modifier

- S-Flow V6200 is designed for medium shear applications
- If Shear stability is critical, V6200 performs well in high viscosity index Group II base oils
- Thickening efficiency is optimized for maximum performance

# Conclusions

- The performance of both products has been demonstrated in a number of commercially available Group I and Group II base oils
- S-Flow V1201 is a very shear stable polymer where shear stability is critical
- S-Flow V6200 is a medium shear stable polymer where thickening capability is more critical than shear