



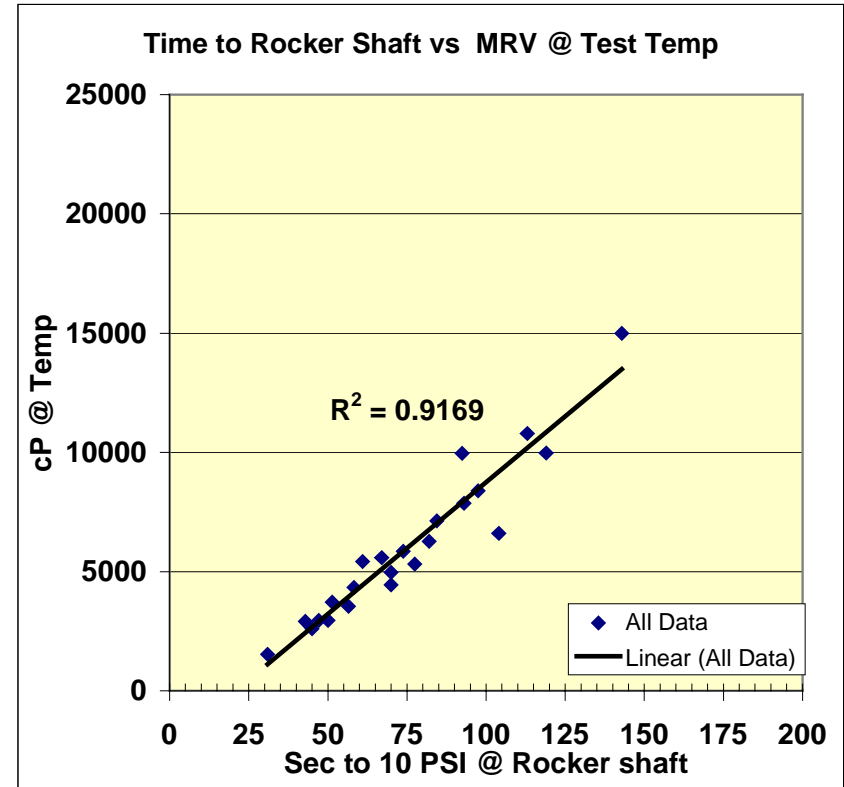
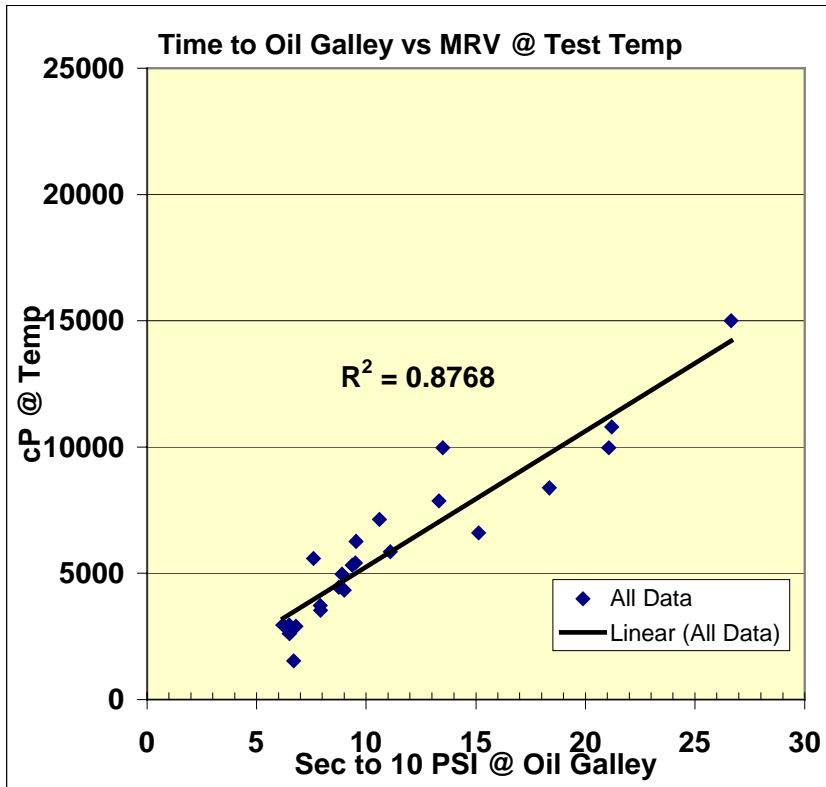
M11 Low Temperature Flow

**Presentation to
HDEOCP
August 16, 2001
David M Stehouwer**

Preliminary Conclusions

- It is possible for poorly dispersed soot to increase viscosity dramatically
- Well dispersed soot increases lube viscosity as soot increases
- For well dispersed soot in lubricants, and for fresh lubricants pumping time through the engine correlates with MRV viscosity.
- Based on very limited data, correlation seems best with modified MRV.

Correlation of MRV to Engine Flow

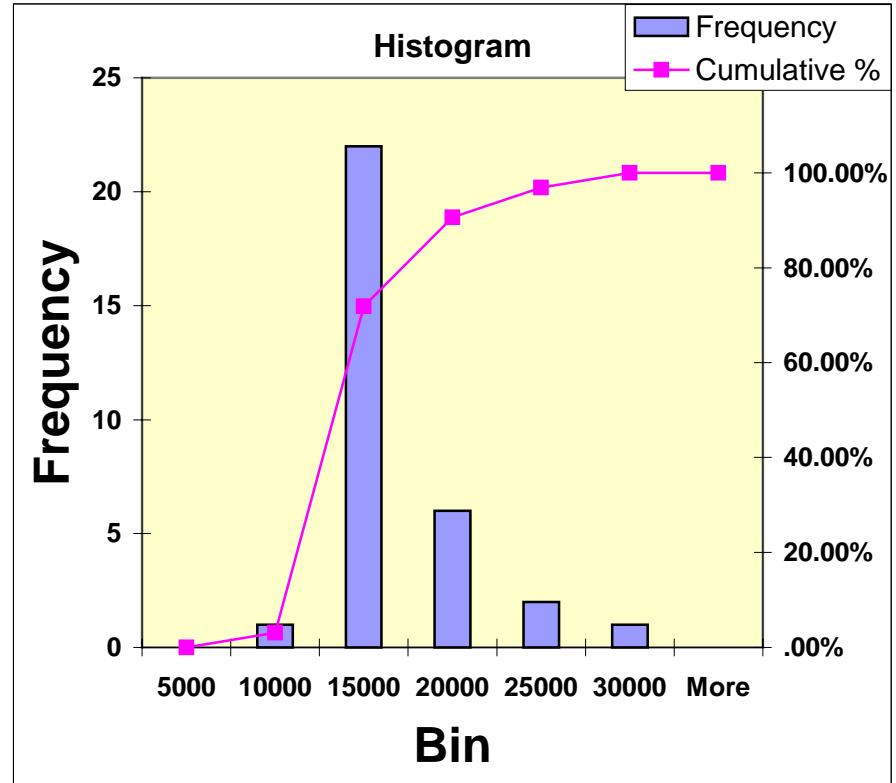


M-11 Low Temp Pumpability

- Oils at -25 C would not allow the engine to crank
- This suggests 20 000 cP as a critical viscosity
- Given results from C. May LOTRUO data 25 000 cP seemed reasonable
- SWRI Data shows:
 - ✓ 72% of oils below 15,000 cP @ 75 hrs
 - ✓ 97 % of oils below 25,000 cP

SWRI MRV data on 75 hr samples

	<i>Bin</i>	<i>Frequency</i>	<i>Cumulative %</i>
	0 to 5000	0	.00%
	5001 to 10000	1	3.13%
	10001 to 15000	22	71.88%
	15001 to 20000	6	90.63%
	20001 to 25000	2	96.88%
	25001 to 30000	1	100.00%
	More	0	100.00%



Proposed Limits for MRV @ -20

