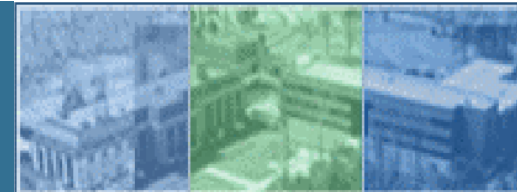


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Use of FTIR in Extraction/Recovery of Asphalt Binders

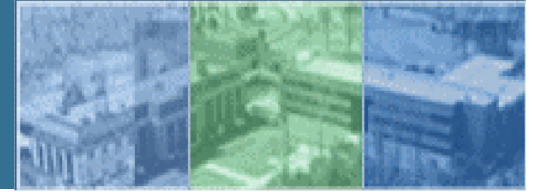
Federal Highway Administration
Turner-Fairbank Highway Research Center (TFHRC)
McLean, VA

Terry Arnold, FHWA
Anant Shastry, ESC & Associates
Susan Needham, SES Group & Associates

Petersen Asphalt Conference
and P3 Symposium 2010



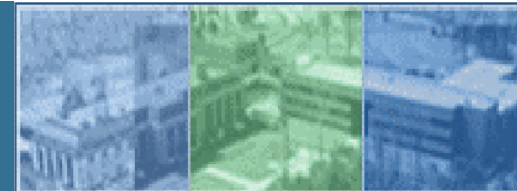
U.S. Department of Transportation
Federal Highway Administration



AASHTO Test Methods for the Extraction/Recovery of Asphalt Binder:

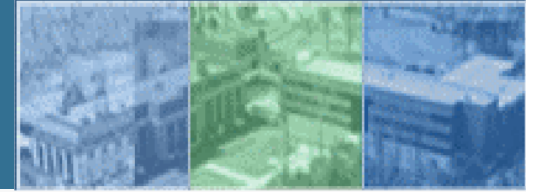
- “Quantitative Extraction and Recovery of Asphalt Binder from Asphalt Mixtures” – AASHTO Designation: T 319-03 (2007).
- “Recovery of Asphalt from Solution by Abson Method”– AASHTO Designation: T 170-001 (2005).
- “Standard Practice for Recovery of Asphalt from Solution Using the Rotary Evaporator” – D5404





- **These methods use a centrifuge to remove fines**
- **Abson uses an electric heating Mantle to remove solvent**
- **SHRP uses Rotovap and Hot Oil Bath at 138°C to remove solvent**



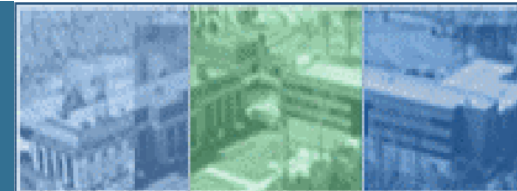


Did we remove all the fines?

**Does the recovered binder contain
any residual solvent?**

How would we know?

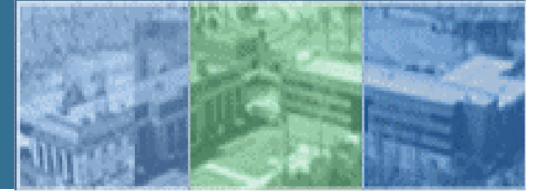




Chemlab High Speed Centrifuge run at 7500 rpm for 15 minutes showed that the solution after processing through the centrifuge typically contained 0.1% of aggregate fines.

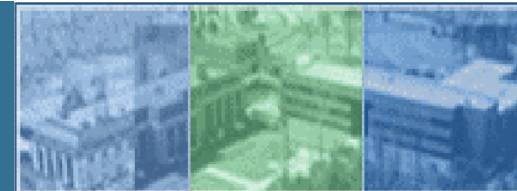
Would this amount of fines influence the Performance Grade?





High Speed Centrifuge





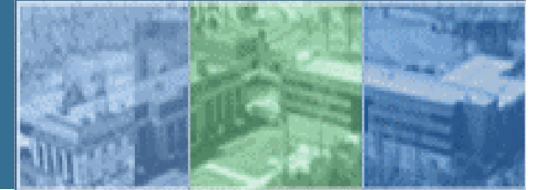
Did we overheat the sample?

**Electric Heating Mantle – no
temperature control once the
solvent has evaporated**

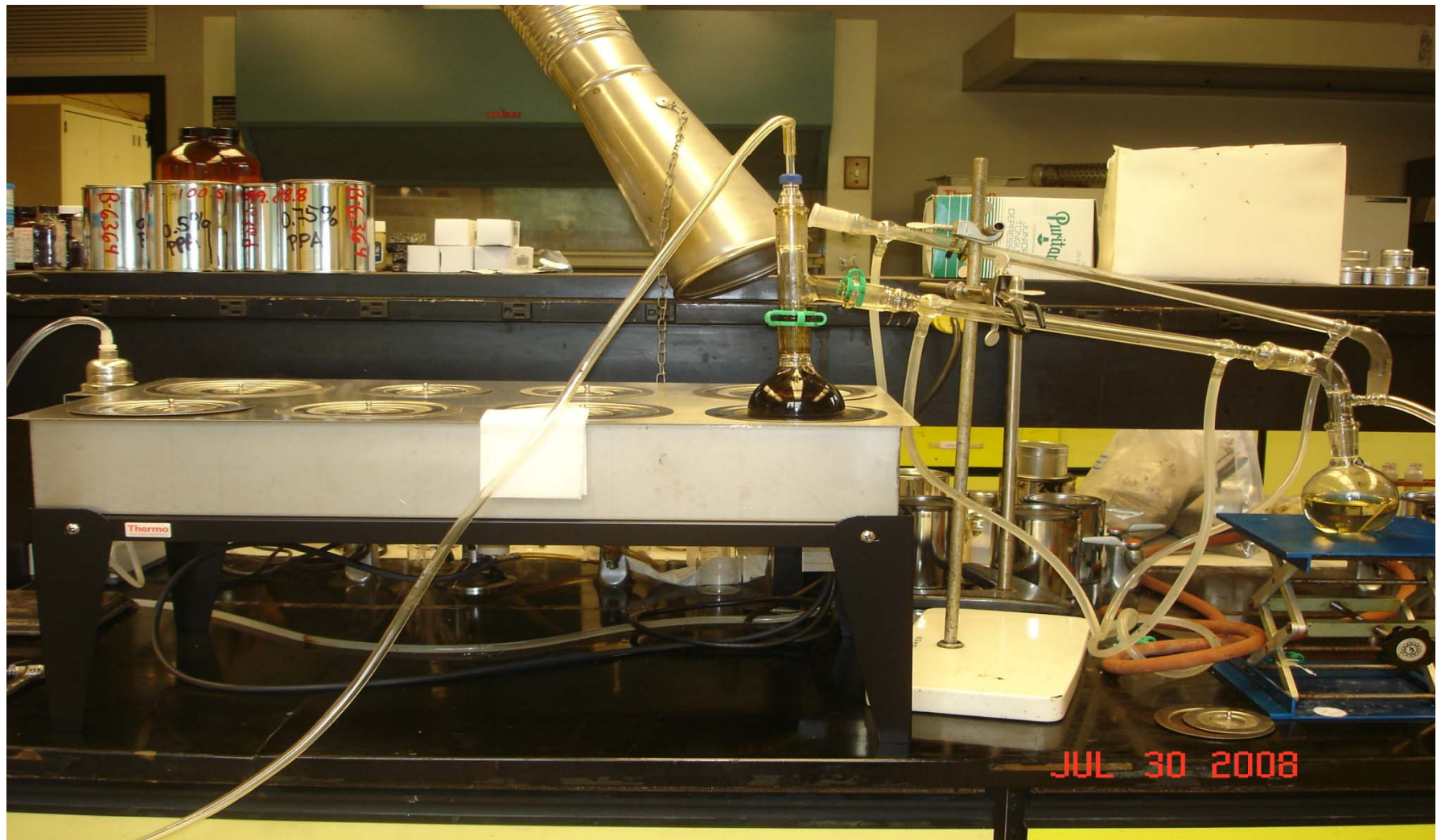
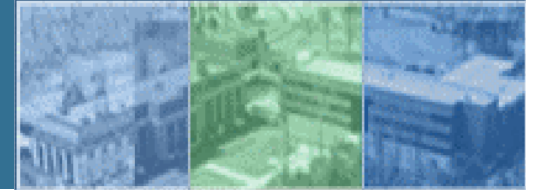
Rotovap with oil bath at 138°C



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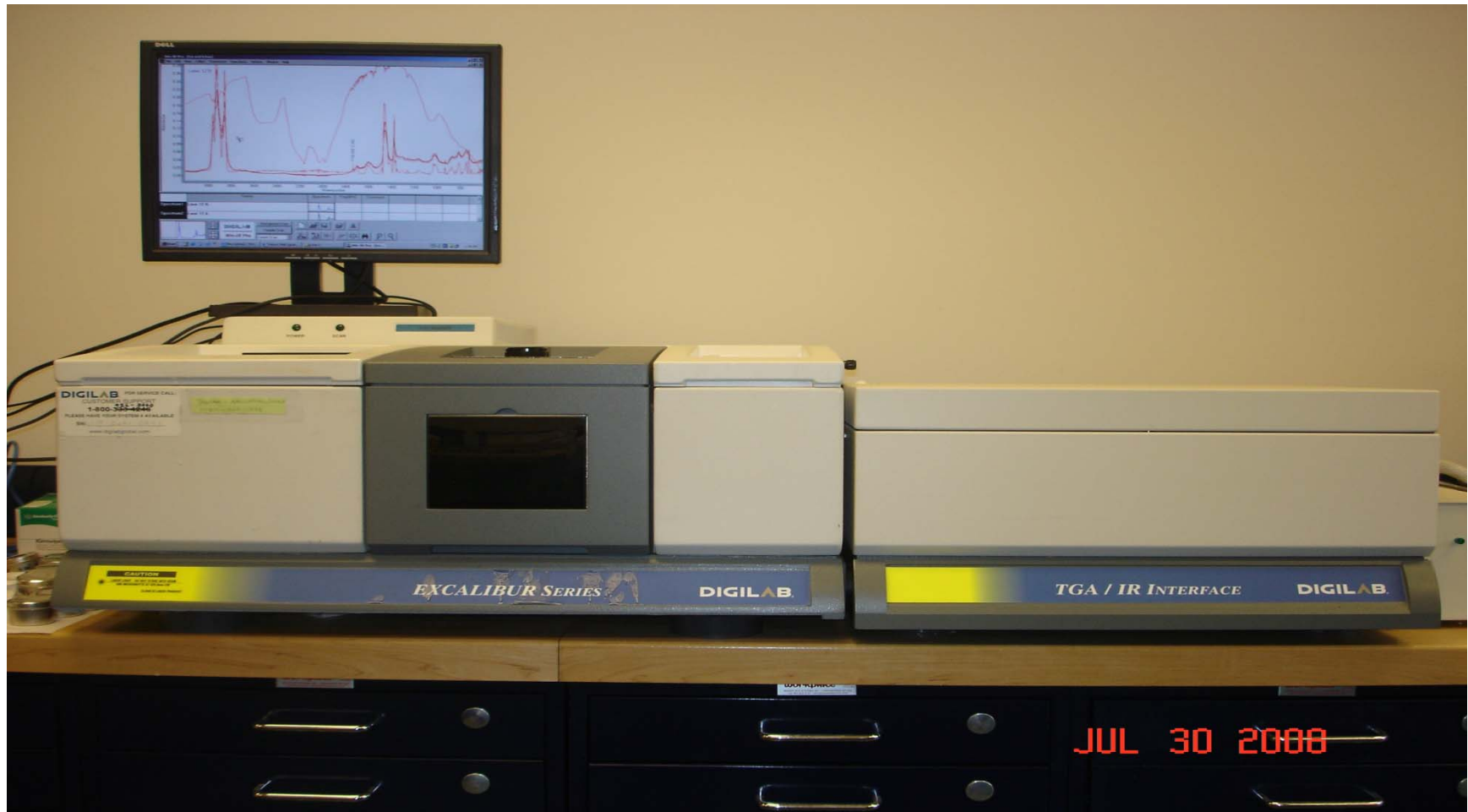
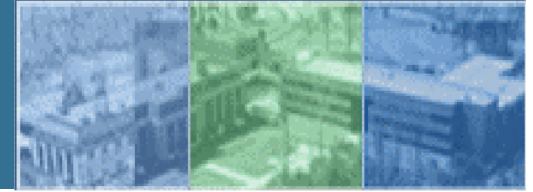


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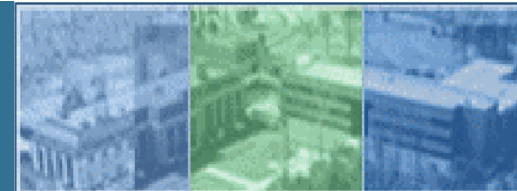


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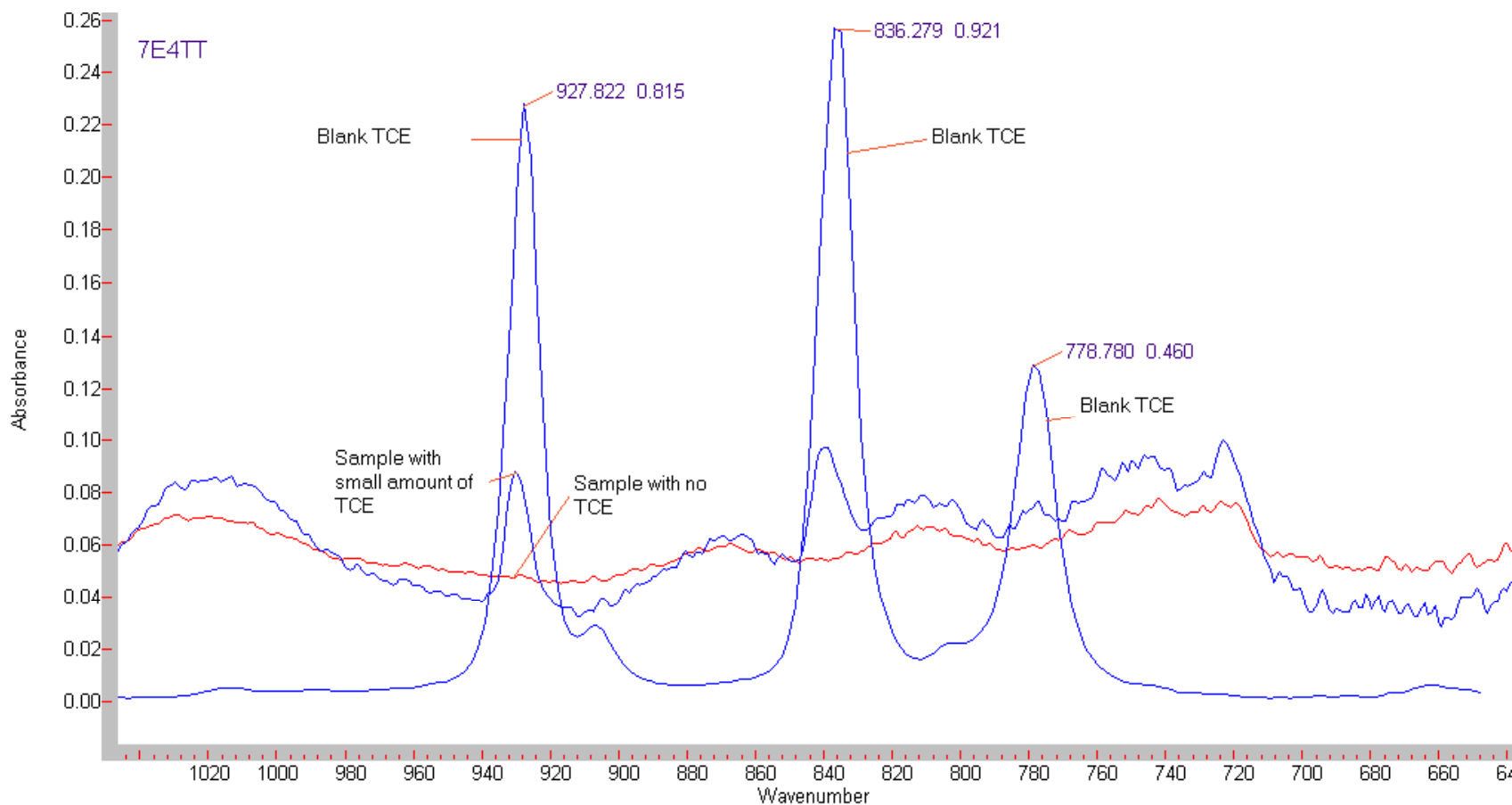
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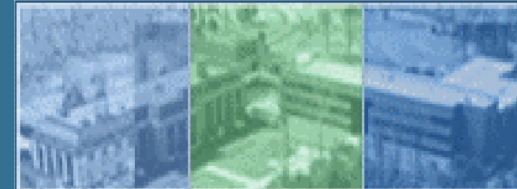


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FTIR Spectrum Showing Residual Solvent

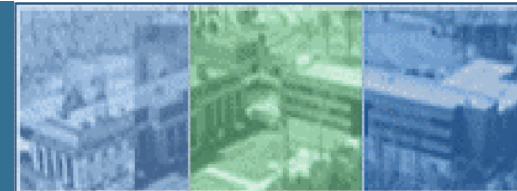




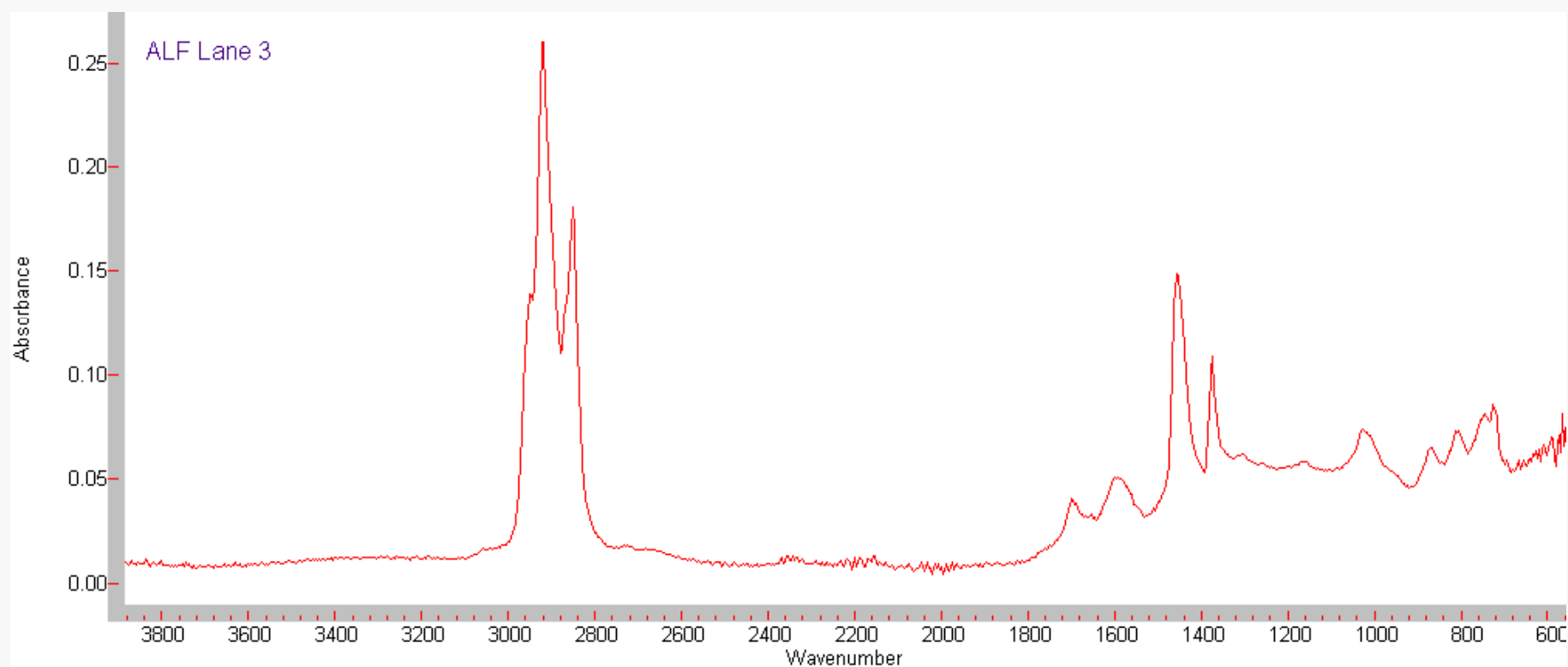
Rheology of Recovered Binder

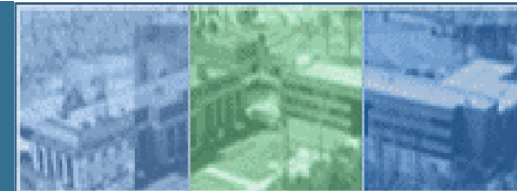
Recovered by Steam Bath Method Continuous PG Grade	
1	60.4
2	59.3
3	62.3
Recovered by Abson Method Continuous PG Grade	
1	63.5
2	63.7
3	65.2
4	65.2



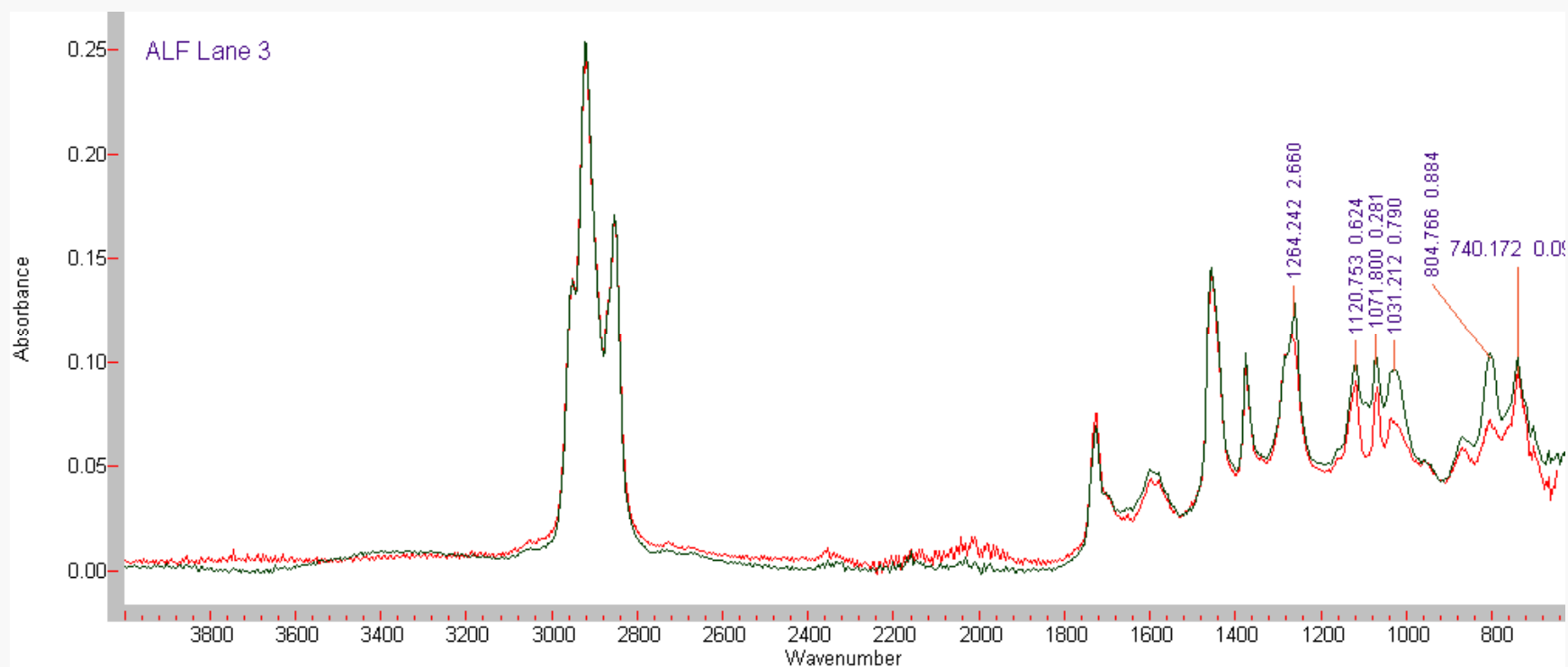


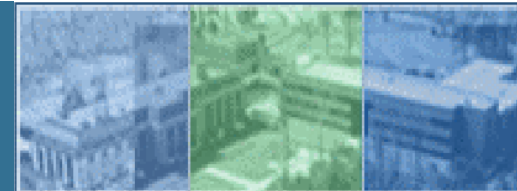
Recovered Binder PG-100



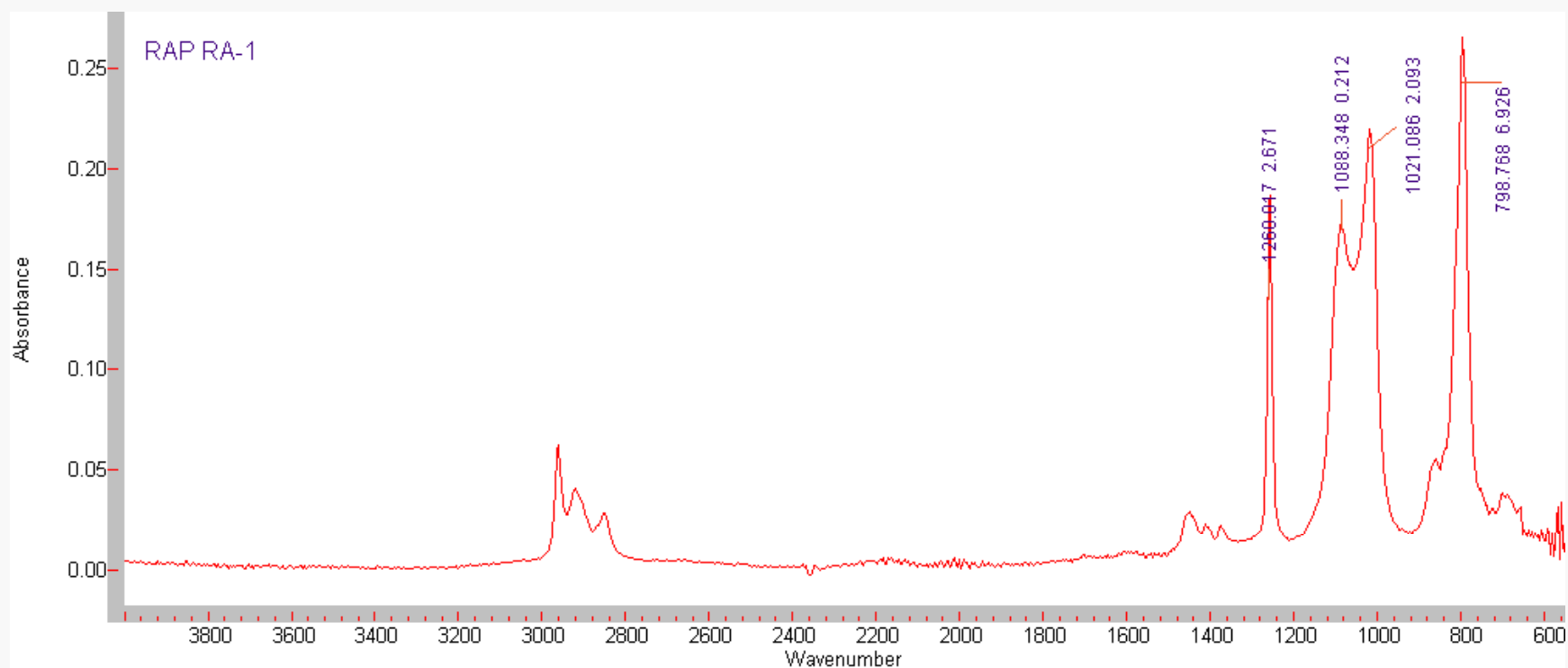


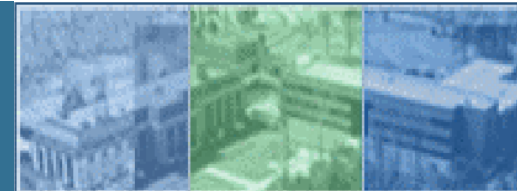
Change in Chemical Structure Due to Solvent PG 70



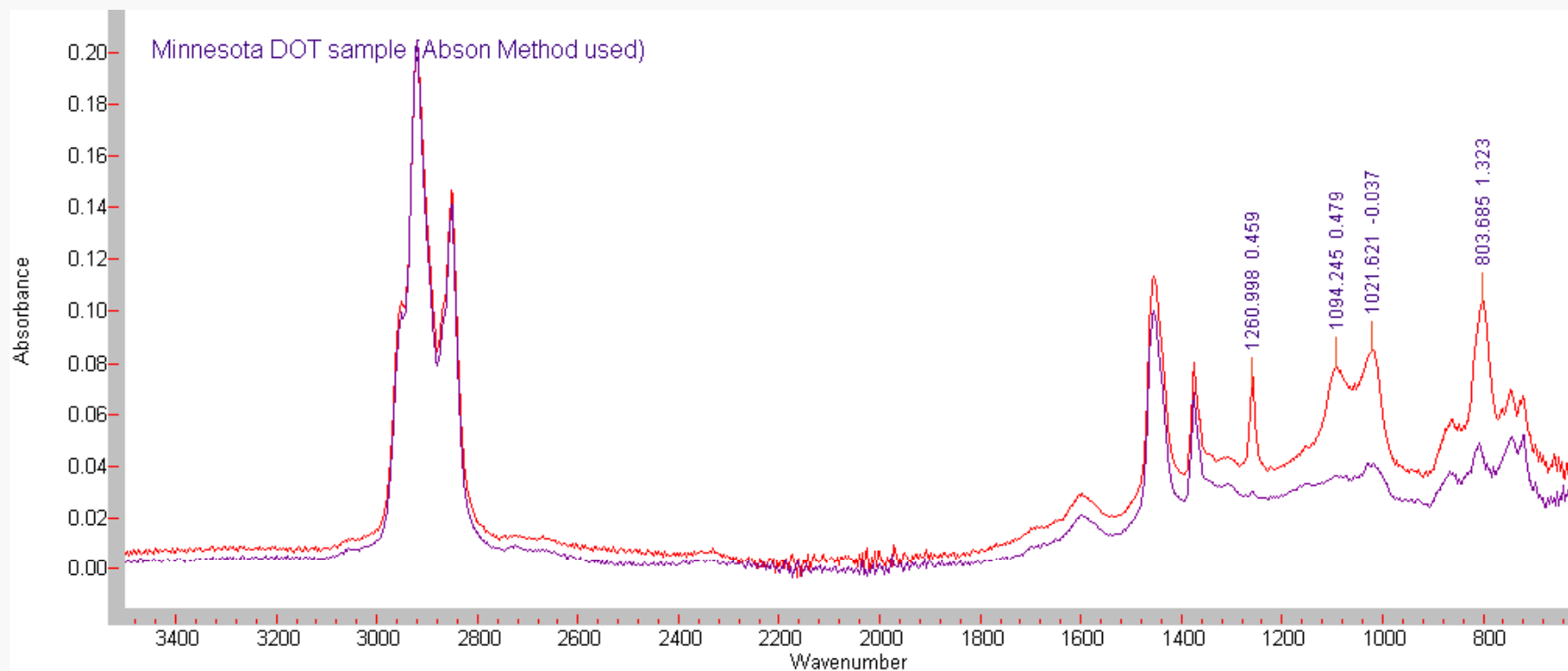


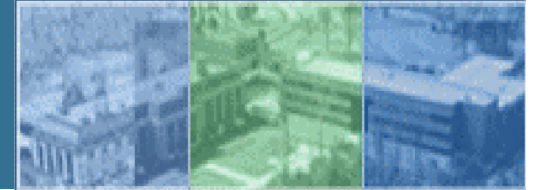
Change in Chemical Structure Due to Solvent





Change in Chemical Structure Due to Time in Solvent

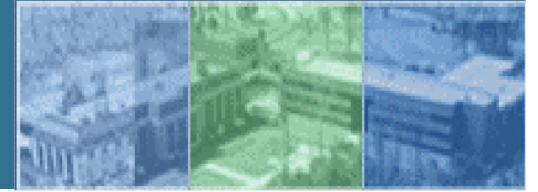




Conclusion

1. The centrifuge does not remove all the fines.
2. Absorption recovery method gave a higher PG grade than the steam bath method.
3. The established recovery methods do not always remove the last traces of solvent.
4. The time spent in solvent solution affects the FTIR Spectrum and lowers the PG



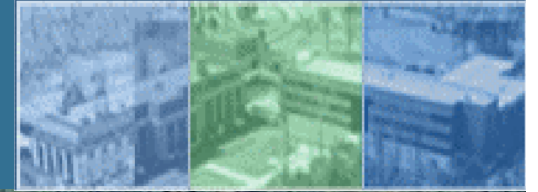


Acknowledgements:

Scot Parobeck
Adrian Andriescu



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Thank you!



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