

ESDU-SPE-M15-1



Sept.10: Stirred vessel fouling tests and research into crude oil fouling

Unamended
Issued October 2010





RESEARCH IN CRUDE OIL FOULING

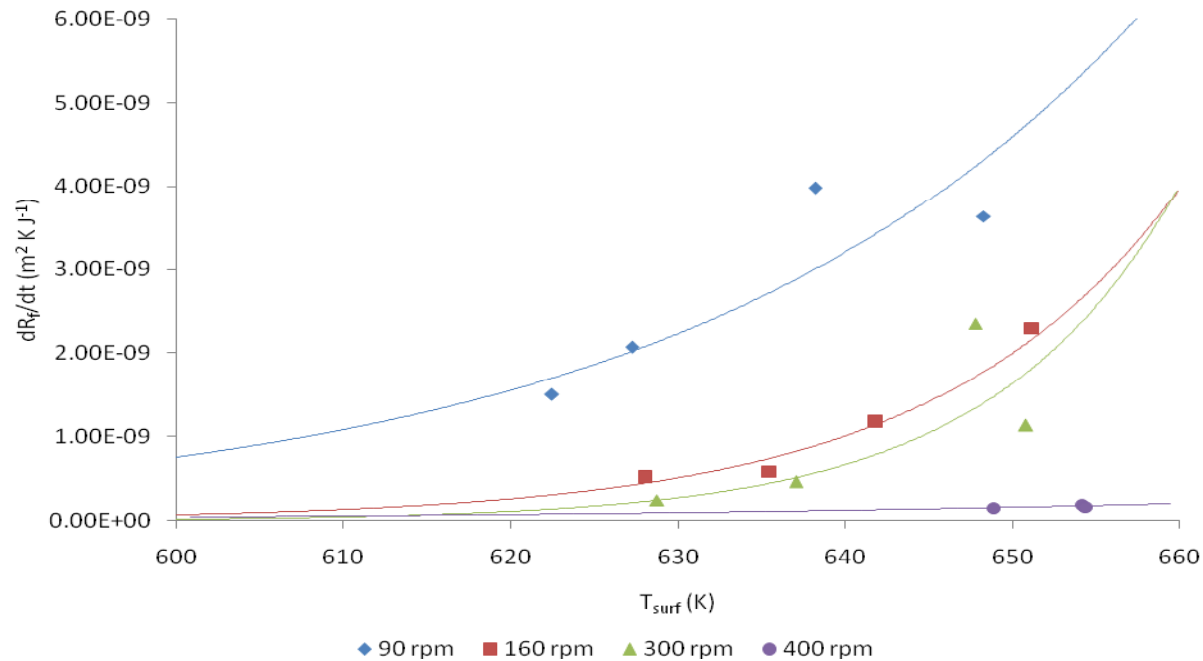
Prof Barry Crittenden and Dr Mengyan Yang
CROF meeting 29-30 September 2010

RESEARCH CONDUCTED SINCE SEPTEMBER 2009

1. Further experiments using the stirred cell system to determine fouling rate for Exxon-Mobil crude under different operational conditions.
2. Estimation of the fouling threshold conditions based on the fouling test results.
3. Additions to the established compensation plot.
4. CFD simulation for fluid flow in a tube fitted with inserts.
5. Unifying threshold model for bare tubes and tubes fitted with inserts.

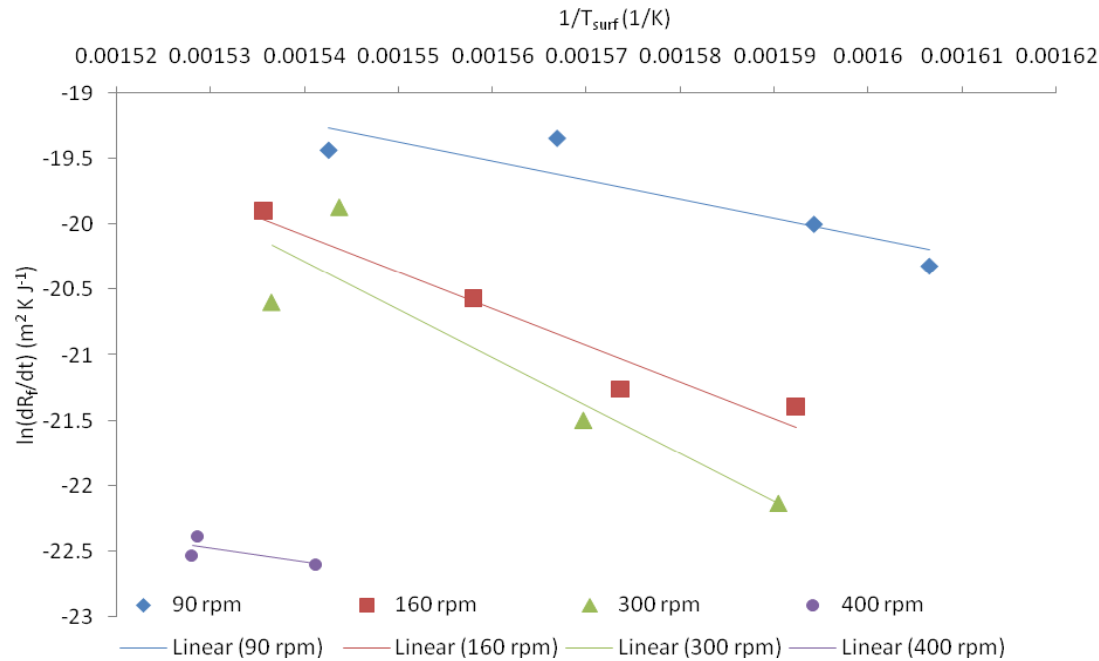


EFFECT OF SURFACE TEMPERATURE ON FOULING RATE



Fouling rate increases with surface temperature, possibly exponentially.

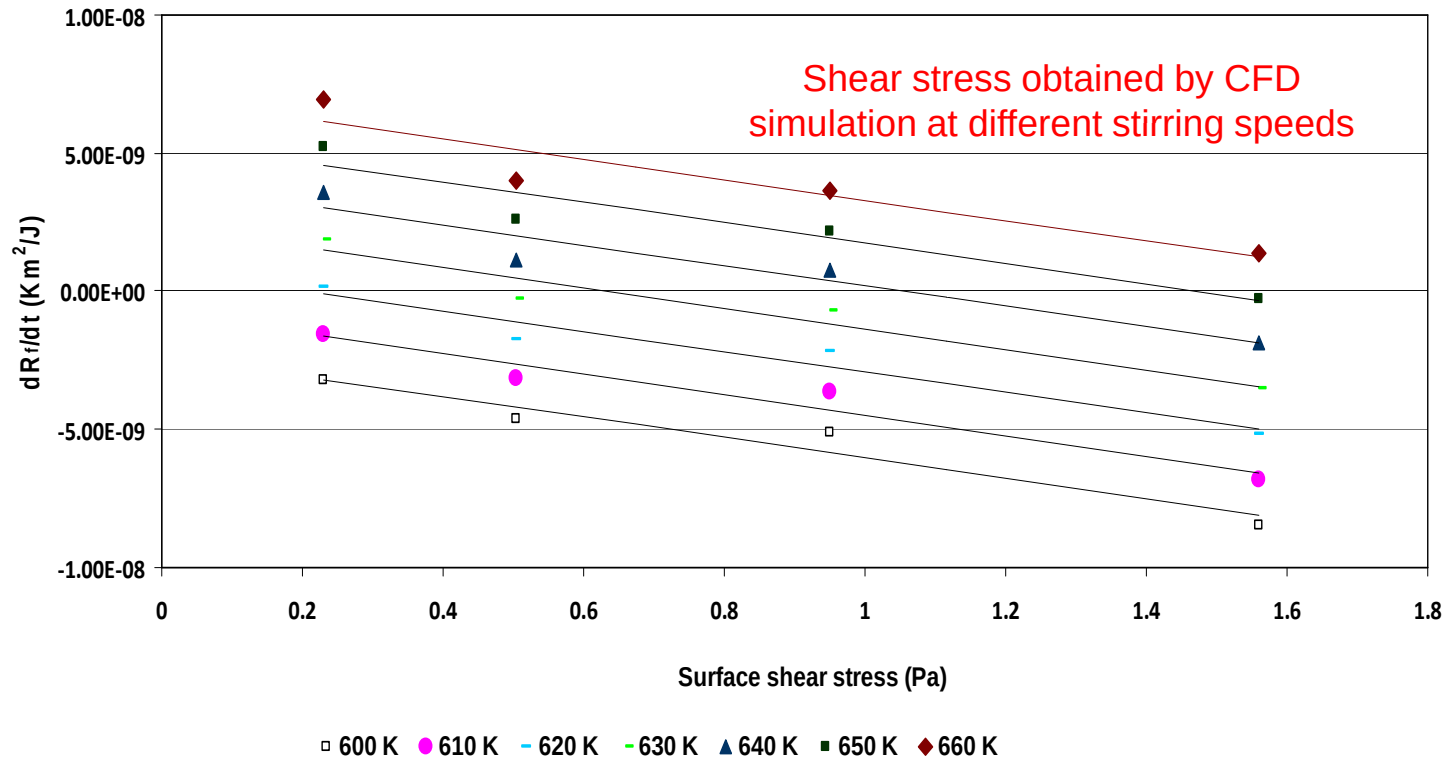
ARRHENIUS PLOTS



Apparent activation energy was obtained from the Arrhenius plots.

Apparent activation energy generally increases with increasing stirring speed, hence with wall shear stress.

EFFECT OF SURFACE SHEAR STRESS ON FOULING RATE



Increasing the wall shear stress decreases the rate of fouling for a given surface temperature.

Under certain conditions, negative fouling rates could be observed meaning that the rate of removal could exceed the rate of deposition onto existing fouling deposits.