



ACE TECHNOLOGY: VARIABLE CONTACT TIME MEASUREMENTS

SUMMARY

ACE Technology® can measure the effects of varying hydrocarbon contact time by adjusting the axial position of the feed injector - a proprietary feature of ACE reactor design. Raising the injector to decrease contact time causes yield performance to shift in a manner consistent with commercial experience. This capability is important for catalyst selection and development, feedstock qualification, commercial FCC design, and kinetic modeling.

VARIABLE CONTACT TIME

The time that hydrocarbons are in contact with catalyst is a dominant factor affecting FCC performance. Reducing the contact time in a commercial operation (with everything else remaining the same) typically results in (1) increases in catalyst-to-oil and olefinicities (C2 through C4), (2) decreases in delta coke, conversion, dry gas, LPG, and distillate-to-bottoms, and (3) either an increase or decrease in gasoline. Many FCC units have recently been improved by revamping the operations to shorter hydrocarbon contact times.

It is important for lab-scale FCC tests to provide relevant data with respect to contact time. In addition to the directional trends noted above, the magnitude of the yield shifts should also agree with commercial results. There are several ways to vary contact time in lab-scale reactors. The widely known techniques (altering either catalyst charge, feed rate, and/or diluent rates) provide results, however, which are not entirely consistent with commercial experience.

THE ACE TECHNOLOGY METHOD

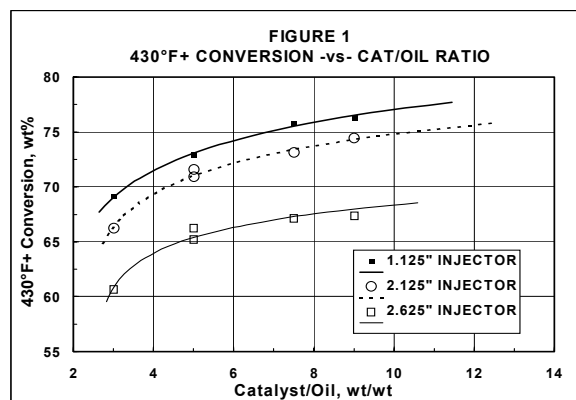
ACE Technology is designed so hydrocarbon contact time may be varied easily, reproducibly, and with results which relate well to commercial experience. The proprietary technique, exclusive to the ACE reactor design, is to alter the axial position of the feed injector. Both the ACE-Model R and Model P units have this capability.

TYPICAL DATA

Tables 1 and 2 and Figures 1 through 7 summarize cracking runs performed at different contact times in an ACE-Model R unit at a cracking temperature of 990°F (532°C). The contact time is varied by moving the feed injector axially.

TABLE 1
CATALYST PROPERTIES

Catalyst	ECAT
Total SA, m ² /gm	213
Zeolitic SA, m ² /gm	142
Matrix SA, m ² /gm	71
Z/M	2.0
RE ₂ O ₃ , wt%	2.4
UCS	24.34
Nickel, ppmw	1400
Vanadium, ppmw	2500

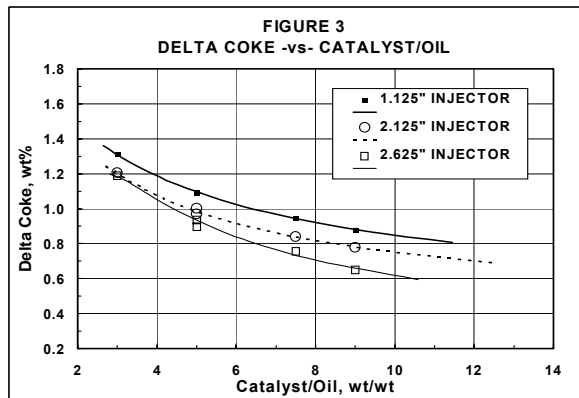
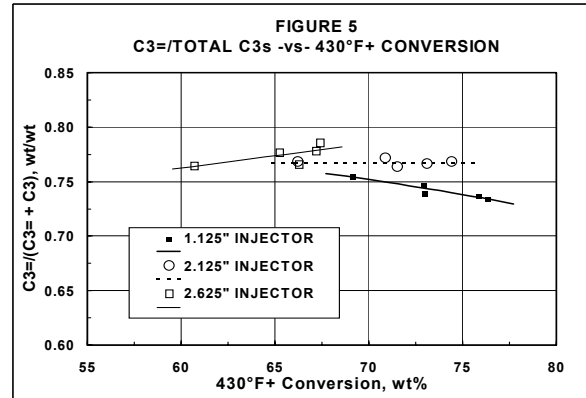
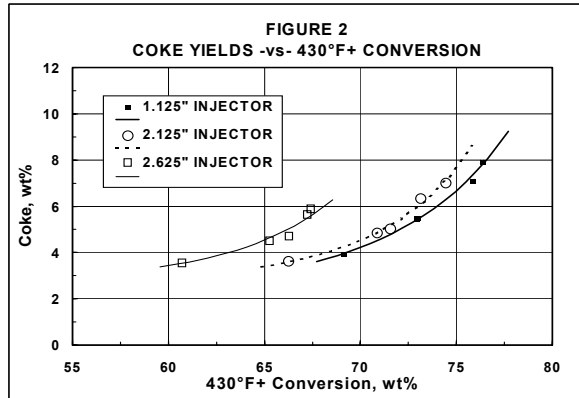


The injector positions noted in the Figures are measured from the reactor bottom. The relative contact time for the positions are: 1.125" injector, 1.00 relative contact time; 2.125" injector, 0.60 relative contact time; and 2.625" injector, 0.36 relative contact time. For these data sets both the catalyst charge and feed injection rate are held constant.

TABLE 2
FEED PROPERTIES

Feedstock	Feed A
API Gravity	21.2
Specific Gravity, 60/60°F	0.927
Sulfur, wt%	0.87
Conradson Carbon Residue, wt%	0.8
Distillation (D 2887)	wt% °F/°C
	10 659 / 348
	50 833 / 445
	90 983 / 528

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Hydrocarbon contact time influences dry gas, C3 olefinicity, gasoline, and bottoms conversion as shown in Figures 4 through 7. These data are specific to the feed and catalyst studied. A significant effect of decreasing contact time for this case study is the deterioration in bottoms destruction at either constant conversion or coke.

Decreasing contact time impacts conversion, coke, and delta coke as shown in Figures 1 through 3. At constant coke, as contact time decreases (going from the 1.125" injector to the 2.625" injector), conversion decreases, delta coke decreases, and required catalyst-to-oil increases.

