Abstract

Ethylene is the world’s most important petrochemical, and steam cracking is by far the dominant method of production. In recent years, several economic trends have arisen that have motivated producers to examine alternative means for the cracking of hydrocarbons. Propylene demand is growing faster than ethylene demand, a trend that is expected to continue for the foreseeable future. Hydraulic fracturing in the United States has led to an oversupply of liquefied petroleum gas (LPG) which, in turn, has led to low ethane prices and a shift in olefin feedstock from naphtha to ethane. This shift to ethane has led to a relative reduction in the production of propylene. Conventional steam cracking of naphtha is limited by the kinetic behavior of the pyrolysis reactions to a propylene-to-ethylene ratio of 0.6–0.7.

These trends have led producers to search for alternative ways to produce propylene. Several of these—propane dehydrogenation and metathesis, for example—have seen large numbers of newly constructed plants in recent years. Another avenue producers have examined is fluid catalytic cracking (FCC). FCC is the world’s second largest source of propylene. This propylene is essentially a byproduct of refinery gasoline production. However, in recent years, an effort has been made to increase ethylene and propylene yields to the point that these light olefins become the primary products. Also, in the refinery, the usual feed to an FCC unit is a heavy hydrocarbon. The question is, can a viable process be developed whereby naphtha is fed to an FCC unit that is optimized for light olefins?

This report attempts to answer that question. We examine two such technologies. SK Energy, in partnership with KBR, has developed a process called Advanced Catalytic Olefins® (ACO). This technology has been commercialized at KBR’s Ulshan, South Korea location. We also examine the application of a downflow FCC technology to the cracking of naphtha. Finally, we present a design study for the production of ethylene from a condensate feedstock via steam cracking.
Contents

1 Introduction 7
2 Summary 8
   Conclusions 8
   The Advanced Catalytic Olefins® (ACO) process 9
   Process economics 10
   The downflow FCC process 11
   Process economics 12
   Process comparison on a Chinese basis 14
   Steam cracking of condensate 15
   Process economics 16
3 Industry status 18
   Characteristics of the market 19
4 Technology review 20
   General considerations 20
   SK Energy Advanced Catalytic Olefins® (ACO) technology 22
   Downflow FCC process 23
   HS-FCC 24
   FCC general considerations 26
   Catalysts 26
   High-severity fluidized catalytic cracking process 26
   Pilot plant results 27
   Semicommercial unit 28
5 SK Energy Advanced Catalytic Olefins® (ACO) technology 30
   Process description 30
   Reaction and quench 32
   Compression, drying, and depropanizer 32
   Subcooling and separation 33
   Product separation 33
   Refrigeration 34
   Steam distribution 34
   Process discussion 37
   General considerations 38
   Reaction and quench 38
   Three-stage cracked gas compression 38
   Cost estimates 59
   Capital costs 59
   Production costs 60
6 Ethylene from wide-range naphtha via downflow FCC process 66
   Process description 66
   Reaction and quench 66
   Compression, drying, and depropanizer 67
   Subcooling and separation 68
   Product separation 68
   Refrigeration 68
   Steam distribution 69
Tables

Table 2.1 Summary of ACO process economics 9
Table 2.2 Summary of cracking yields 9
Table 2.3 Ethylene from wide-range naphtha via ACO process—Production costs 10
Table 2.4 Ethylene from wide-range naphtha via downflow FCC process—Production costs 13
Table 2.5 Comparison of production costs 15
Table 2.6 Ethylene from wide-range naphtha via front-end depropanizer—Production costs 16
Table 3.1 World consumption of ethylene 18
Table 3.2 World ethylene consumption by end use 19
Table 4.1 Properties of feed oils 28
Table 4.2 HS-FCC pilot plant product yields for various feeds 28
Table 4.3 HS-FCC semicommercial unit product yields for Arabian light-derived feeds 29
Table 5.1 Ethylene from naphtha via ACO process—Design bases 31
Table 5.2 Ethylene from wide-range naphtha via ACO process—Naphtha cracking yields (wt%) 35
Table 5.3 Ethylene from naphtha via ACO process—Hourly stream flows 36
Table 5.4 Ethylene from naphtha via ACO process—Major equipment 55
Table 5.5 Ethylene from wide-range naphtha via ACO process—Total capital investment 61
Table 5.6 Ethylene from wide-range naphtha via downflow FCC process—Design bases 70
Table 5.7 Ethylene from wide-range naphtha via downflow FCC process—Naphtha cracking yields (wt%) 71
Table 6.1 Ethylene from naphtha via downflow FCC process—Design bases 70
Table 6.2 Ethylene from wide-range naphtha via downflow FCC process—Naphtha cracking yields (wt%) 71
Table 6.3a Ethylene from wide-range naphtha via downflow FCC process—Ethane cracking yields (wt%) 72
Table 6.3b Ethylene from wide-range naphtha via downflow FCC process—Propane cracking yields (wt%) 73
Table 6.4 Ethylene from wide-range naphtha via downflow FCC process—Hourly stream flows 74
Table 6.5 Ethylene from wide-range naphtha via downflow FCC process—Major equipment 89
Table 6.6 Ethylene from wide-range naphtha via downflow FCC process—Total capital investment 92

Appendix A—Patent summary 133
Appendix B—Cited references 136
Appendix C—Process flow diagrams 139

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Table 6.7 Ethylene from wide-range naphtha via downflow FCC process—Production costs 93
Table 7.1 Ethylene from condensate with front-end depropanizer—Design bases 101
Table 7.2 Algerian condensate assay 102
Table 7.3 Cracking yields (weight percent) 103
Table 7.4 Cracking yields (molar percent) 104
Table 7.5 Gas cracking yields 104
Table 7.6 Ethylene from Algerian condensate—Hourly stream flows 106
Table 7.7 Ethylene from condensate with front-end depropanizer—Major equipment 124
Table 7.8 Comparison of major equipment size differences—Condensate versus naphtha 127
Table 7.9 Ethylene from condensate with front-end depropanizer, maximum propylene (US Gulf Coast basis)—Total capital investment 128
Table 7.10 Ethylene from condensate with front-end depropanizer, maximum propylene—Production costs 129
Table 7.11 Ethylene from wide-range naphtha, front-end depropanizer, maximum propylene—Production costs 131

Figures

Figure 4.1 Olefinicity index versus hydrocarbon partial pressure 21
Figure 4.2 Typical ACO process configuration 23
Figure 4.3 Separator and downflow reactor 24
Figure 4.4 HS-FCC reactor and regenerator system 25
Figure 4.5 Simplified cracking reaction network 25
Figure 5.1 Ethylene from naphtha via ACO process (sheet 1 of 6) 140
Figure 5.1 Ethylene from naphtha via ACO process (sheet 2 of 6) 141
Figure 5.1 Ethylene from naphtha via ACO process (sheet 3 of 6) 142
Figure 5.1 Ethylene from naphtha via ACO process (sheet 4 of 6) 143
Figure 5.1 Ethylene from naphtha via ACO process (sheet 5 of 6) 144
Figure 5.1 Ethylene from naphtha via ACO process (sheet 6 of 6) 145
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 1 of 6) 146
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 2 of 6) 147
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 3 of 6) 148
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 4 of 6) 149
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 5 of 6) 150
Figure 6.1 Ethylene from naphtha via downflow FCC process (sheet 6 of 6) 151
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 1 of 6) 152
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 2 of 6) 153
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 3 of 6) 154
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 4 of 6) 155
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 5 of 6) 156
Figure 7.1 Ethylene from condensate with front-end depropanizer (sheet 6 of 6) 157