

Index

a

- A8 isomers 322
- absolute average deviation (AAD) 53
- absorbers
 - atmospheric distillation unit 92, 160
 - fluid catalytic cracking 187
 - vacuum distillation unit 160
- acentric factor 39
- acid-catalyzed cracking reactions 189
- acid number, ASTM D3339-11 5
- activity coefficient 47
- activity factors
 - alkylation 518
 - continuous catalyst generation
 - reforming 384
 - fluid catalytic cracking 200, 265
 - hydrocracking 491
 - hydroprocessing units 425, 476
- adjustment factors 332
- adsorption 310
- advanced kinetic and property
 - parameters 532
- air leaks 153
- alkylation
 - feed components and alkylation
 - kinetics 518–519
 - hydrofluoric acid alkylation process
 - simulation 519–527
 - process description 517–518
- alkylation simulation model 520
- alkylcycloalkanes 311
- alkylcyclopentanes 311
- American Petroleum Institute (API)
 - correlations
 - atmospheric distillation unit 85
 - continuous catalyst regeneration
 - reforming 326
 - fluid catalytic cracking 208
 - hydroprocessing units 443, 512
 - amine 69, 474
 - aniline point 5
 - API gravity 2
 - Apparent heat of cracking 257
 - Aqueous phase 95
 - Arab Heavy density distribution 79
 - Arab Heavy TBP distillation curve 78
 - Arab Light density distribution 81
 - Arab Light TBP distillation curve 80
 - aromatic content
 - coefficients for 206
 - aromatic hydrogenation 464, 513
 - aromatic ring condensation 189
 - aromatics
 - continuous catalyst regeneration
 - reforming 309, 344
 - fluid catalytic cracking 191, 235
 - hydroprocessing units 413
- Arrhenius equation 530
- Aspen HYSYS
 - alkylation model 518
 - atmospheric distillation unit 77
 - continuous catalyst regeneration
 - reforming 354
 - main fractionator 267
 - initial component and
 - thermodynamics setup 356, 358
 - input feedstock and process variables
 - 362, 367

- Aspen HYSYS (*contd.*)
 - molecular composition information
 - 372, 376
 - for process engineering 551
 - oil fractions 25–32
 - process overview and relevant data
 - 354, 356
 - refinery reactor models 552
 - reformer configuration 358, 362
 - with rigorous reactor 553
 - solver parameters and running initial model 368, 369
 - vacuum distillation unit 157, 165
 - viewing model results 370
- Aspen HYSYS petroleum refining
 - catalytic reformer model 354
 - deep-cut operation 172
 - delayed coker 530
 - fluid catalytic cracking 231
 - hydrocracking 471
 - new petroleum assay manager
 - 25–32
 - old oil manager 16–25
- Aspen HYSYS petroleum refining, atmospheric CDUs
 - adding custom stream properties
 - 101–104
 - Arab Heavy assays, bulk properties of 83
 - Arab Light assays, bulk properties of 84
 - blend streams, specification of 86
 - creating blends from assays 81, 85
 - creation and configuration of CDU
 - 88–95
 - crude charge feed and
 - prefractionation unit 87–88
 - density distributions, specification of 83
 - generated pseudocomponent list
 - review 83, 86
 - initial assay definition-TBP
 - distillation data 82
 - light gas components of assays 84, 85
 - operating profile measurements 105
 - petroleum assay manager 77
 - plant performance, adjustments to
 - 104
 - pumparounds for 98–101
 - results 105–109
 - side strippers 95–98
 - thermodynamic model selection
 - 84–87
 - validating column model predictions, reality checks for 105
- Aspen HYSYS petroleum refining, delayed coker model 530
- Aspen HYSYS petroleum refining FCC model
 - and associated gas plant, schematic illustration 211
 - average voidage 196–197
 - calibration parameters 199–200
 - catalyst deactivation 198–199
 - debutanizer temperature profile 218
 - diesel density comparison 215
 - diesel flash point comparison 215
 - diesel product, ASTM D86 distillation for 213
 - distillation curves 203–205
 - dry gas composition 216
 - fractionation 200–202
 - gasoline density comparison 214
 - gasoline product, ASTM D86
 - distillation for 213, 214
 - kinetic lump transition to boiling
 - point-based pseudocomponents 208
 - LPG composition 216
 - 21-lump kinetic model 197–198
 - main fractionator temperature profile
 - 217
 - modeling strategy 209–211
 - molecular composition 205–208
 - primary absorber temperature profile 218
 - primary stripper temperature profile
 - 217
 - product yield results 211
 - slip factor 196–197
 - sponge oil absorber temperature
 - profile 219
 - submodels 195

- Aspen HYSYS petroleum refining
 - hydrocracker model 411
 - backward approach 413
 - built-in process flow diagram of 411
 - forward approach 412
 - HDN reaction network of 415
 - HDS reaction network of 413, 414
 - integrated HCR process model 419
 - 97 model compounds 411, 413
 - objective functions in 424, 425, 427
 - reaction activity factors 424, 426, 427
 - reaction network of 413
 - reaction types and inhibitors 416
 - specific gravity predictions 451, 453
 - workshop 497–505
 - Aspen HYSYS petroleum refining software 472
 - Aspen HYSYS V9 531
 - Aspen PIMS 226
 - for production planning 551
 - Aspen RefSYS
 - assays
 - oil fractions 25–32
 - atmospheric distillation unit 72
 - ASTM D86 distillation 6
 - ASTM D1160 distillation 6
 - ASTM D2887 distillation 6
 - ASTM D1160 interconversion 15
 - atmospheric crude distillation units 59
 - Aspen HYSYS Petroleum Refining 77–104
 - backblending procedure 114–125
 - column hydraulic analysis 131–139
 - data requirements and validation 73–76
 - desalting and dewatering process 61–62
 - draw rates effect on product profiles 126–129
 - feed characterization 72–73
 - fractionation zone of 67
 - furnace, purpose of 62
 - improving distillation curves 109
 - initial crude processing, process flow of 60–61
 - kerosene draw rate 110, 111
 - modeling distillation columns 65–72
 - overflash 62
 - petroleum distillation column 140–144
 - preheat train and heat recovery 62
 - process optimization 109–114
 - process variables effects on product qualities 129–131
 - products recovered from 64
 - requirements for 75
 - simulation model representation 76–77
 - stripping steam and product draw rate, effects of 111–114
 - atmospheric distillation 7
 - average absolute deviation (AAD)
 - continuous catalyst regeneration reforming 337–353
 - fluid catalytic cracking 214–216
 - HP hydrocracking 449–453
 - MP hydrocracking 449, 452–453
 - average relative deviation (ARD) 444, 456
 - average voidage 196–197
- b**
- backblending 73
 - atmospheric distillation unit 114, 123
 - fluid catalytic cracking 201, 208, 387
 - vacuum distillation unit 151
 - backblending procedure, atmospheric CDUs 114
 - converging updated column model 120
 - Heated_FEED stream 120–122
 - importing distillation data into Aspen HYSYS 115–116
 - new blend stream 116–119
 - product yield and properties 115
 - results 123–125
 - backblending process 201
 - backward feedstock approach 412
 - base vector 227, 228
 - bench-scale reactors 314

- Benedict-Webb-Rubin-Starling (BWRS) EOS 49
 - benzene 346
 - benzothiophene 411
 - benzene-toluene-xylene (BTX) 309, 347
 - Beta density distribution function
 - atmospheric distillation unit 74
 - continuous catalyst regeneration unit 325
 - fluid catalytic cracking 204
 - oil fractions 10, 74
 - bifunctional/bimetallic catalysts 311
 - blending
 - atmospheric distillation unit 78, 114
 - continuous catalyst regeneration unit 325
 - fluid catalytic cracking 224
 - oil fractions 35
 - boiling point based hypothetical, *see* pseudocomponents; generation
 - boiling point curve 5
 - bottom residue stream 529
 - branched paraffins (BP) 518
 - bulk density 26
 - bulk properties 72
- C**
- calibration 330, 333
 - catalyst configuration, in FCC unit 246–250
 - catalyst deactivation 199
 - catalytic reformer model 319, 323
 - C3-C5 olefins 517
 - cetane index 7
 - cetane number 7
 - Chao-Seader method 48
 - chromatographic simulation 7
 - Chueh-Prausnitz correlation 42
 - Clausius-Clapeyron equation 45
 - cloud point 5
 - CokerFeed 532
 - Coker gas oil (CGO) 185
 - coking process 190
 - component list
 - alkylation 518
 - atmospheric distillation 78
 - continuous catalyst regeneration reforming 356
 - delayed coking 529
 - fluid catalytic cracking 231
 - hydrocracking 356
 - hydroprocessing 356
 - computational fluid dynamics (CFD) 193
 - Conradson carbon residue (CCR) 5, 529, 542
 - continuous catalyst regeneration (CCR) reforming
 - applications 340
 - Aspen HYSYS 354, 376
 - calibration 330, 333
 - catalytic reformer model 319, 323
 - chemical feedstock production 347, 349
 - combined effect 345
 - cyclic processes 305
 - data consistency 329
 - downstream fractionation system 387, 395
 - energy utilization and process performance 349, 350
 - feed characterization 324, 328, 330
 - feed rate, effect of 344
 - feedstock quality, effect of 346
 - fractionation system 323, 324
 - kinetic models and networks 314, 317
 - model calibration 376, 387
 - model implementation 328, 329
 - moving-bed 305
 - overall modeling strategy 333, 335
 - process chemistry 311, 313
 - process overview 304, 311
 - reactor temperature effect 341, 343
 - refinery planning 350, 354
 - results 335, 340
 - RON and product distribution profile 395, 399
 - semiregenerative processes 305
 - thermophysical properties 323
 - unit-level models 317, 319

- correlation
 - API 208
 - Bolkan-Kenny 196
 - Braun-K10 (BK-10) 47
 - Chueh-Prausnitz 42
 - ESSO 86
 - Gooson 208
 - Riazi 209
 - Riazi-Daubert 439
 - Riedel 44
 - Twu 38
 - correlation-based approach 238
 - COSTALD (Correspond States Liquid Density) correlation 42
 - cracking gases 153
 - creep step parameters 480
 - critical pressure 49
 - critical temperature 49
 - critical volume 49
 - crude assays
 - bulk properties
 - API gravity 2
 - CCR 5
 - Ramsbottom carbon residue 5
 - fractional properties 6–7
 - interconversion of distillation curves 7
 - crude distillation, *see* atmospheric crude distillation units
 - crude distillation unit (CDU) 416
 - cubic average boiling point (CABP) 10
 - cubic equation of state 49
 - cut points
 - hydrocracking 438
 - petroleum distillation column 143
 - refinery-wide simulation 553
 - cycle oil 186
 - cyclization
 - CCR reforming 313
 - fluid catalytic cracking 186, 316
 - cyclic processes 305
 - cycloalkanes 188
 - cycloheptane 313
 - cyclohexanes 315
 - cyclones 196
- d**
- D1160 analysis, for heavy FCC feedstock 203
 - data acquisition, HCR 421
 - deactivation 315–317, 399
 - dealkylation 190, 413
 - debutanizer
 - continuous catalyst regeneration reforming 324
 - fluid catalytic cracking 187, 214–218, 233, 275
 - overall column (stage) efficiency 69
 - decyclization 186
 - deep-cut operations 172
 - default calibration parameters 199, 384
 - dehydrocyclization 314
 - dehydrogenation 189
 - dehydroisomerization 311
 - delayed coking
 - coking reaction kinetics 529–530
 - feed characterization 529–530
 - kinetic lumps 529–530
 - petroleum shift reactor 542–548
 - process description 528–529
 - simulation and calibration 530–541
 - delta coke 257
 - DELTA vector 227–229
 - DELTA-BASE matrix 542
 - DELTA-BASE vectors 183, 228–230, 351–353
 - delumping 420, 435
 - building fractionator model 440
 - Gauss-Legendre Quadrature 438–442
 - pseudocomponents 435–437
 - desalting process 61–62
 - dewatering process 61–62
 - DIPPR (Design Institute for Physical Property Research) 44
 - “dirty-water” approach 46
 - dissolved light gases 153
 - distillation-based properties 72
 - distillation columns, modeling of
 - equilibrium-stage approach 65
 - individual stage efficiency 68
 - inside-out algorithm 69–71

- distillation columns, modeling of
 - (*contd.*)
 - MESH equations 66
 - Murphree vapor stage efficiency 67, 68
 - overall stage efficiency 67–69
 - rate-based approach 65
- distillation curves 203–205
 - spreadsheet 7
- D2887 9-point distillation curve 529
- draw rate 91
- dry gas 186

- e**
- effective cut point (ECP) 522
- efficiency factor, *see* Murphree stage efficiency
- end boiling point (EBP) 310
- end of run (EOC) 464
- energy consumption 60, 321, 336, 350, 445
- energy flows 33, 60
- energy utilization 349, 350
- equation of state (EOS) 49
- equilibrium-stage approach 65
- equilibrium catalyst properties 236
- equilibrium stages 67
- ESSO correlation 86
- equation-of-state (EOS) approach 49
- extrapolation of incomplete distillation curve 13

- f**
- feed adjust 413
- feed characterization 324, 328, 330
- feed components and alkylation kinetics
 - alkylation simulation model 520
 - turning factors, classes reactions 518
- feed kinetic lump compositions 530
- feed lumping technique 320
- feedstock preparation 147
- feed system, alkylation reactor 521
- feed type library (fingerprint) 242
- fitting parameters of Beta distribution 203
- flash point 2

- flow diagram 156, 212, 307, 406, 412, 417, 418
- flow rate relationship 522
- fluid catalytic cracking (FCC)
 - cycle oil 413
 - process 8, 306, 310, 317, 333, 350
- fluid catalytic cracking (FCC) unit 183, 231, 408
 - acid-catalyzed cracking reactions 189
 - binary interaction parameters for fluid package 238
 - calibration 258–266
 - case studies 285–291
 - catalyst activity factor and equilibrium metal contents 250
 - catalyst blend 248
 - catalyst library 246, 247
 - catalyst parameters 248
 - component list, addition of 231, 235, 237
 - configuration 240
 - COSTALD method 238
 - dehydrogenation 190
 - dimensions for 240
 - downstream fractionation 187–188
 - equilibrium catalyst properties 236
 - feed configuration 241–246
 - gas flow rates and compositions 236
 - gasoline producer 184
 - gasoline yield, improvement of 220–222
 - gas plant associated with 233
 - gas plant section 188
 - heat losses 240
 - hydrogen transfer reactions 190
 - increasing unit throughput 223–224
 - initial Aspen HYSYS flowsheet 238
 - initial catalyst blend window 246
 - initial solver output 254
 - isomerization reactions 189
 - for linear programming application 226
 - liquid feeds and products 235
 - LP DELTA-BASE vector generation 291–297
 - lumped kinetic model 190–193

- main fractionator 267–275
 - main fractionator associated with 233
 - model results 253–258
 - operating variable configuration 250–252
 - overhead wet gas system and feed sections 275–281
 - reaction section 232
 - regenerator operating variables 251
 - riser and regenerator operating conditions 236
 - riser–regenerator complex 185–187
 - schematic illustration 185, 187
 - simulation flowsheet 234
 - solver convergence options 252
 - standard cut grouped/square cut yields 254
 - submodels for 195
 - sulfur content in gasoline 224–225
 - T301_Absorber and T303_Reabsorber 281–285
 - tuning factors 241
 - unit-level models 193–195
 - Universal Oil Products design 185
 - fluid package 235, 473
 - fluorescent indicator adsorption (FIA) 412
 - fractionation 200–202
 - fractionation index, top section (SI TOP) 522
 - fractionation system 323, 324
 - “free-water” approach 46
 - freeze point 2
 - front-end tail gas 153
 - Froude number 197
 - fuel properties 51
 - fuel property index 51
 - fugacity coefficient 47
- g**
- gasoline
 - continuous catalyst regeneration reforming 395
 - fluid catalytic cracking 187
 - overcracking 291
 - production scenarios 220, 285, 469
 - stabilization column 188
 - Gauss–Legendre quadrature 438–442
 - Gooson correlation 208
 - Grayson-Streed EOS 86
 - Gravity *see* specific gravity
 - gross heat of combustion, *see* high heating value (HHV)
- h**
- heat balance, FCC 257, 266
 - heat capacity 42
 - heat exchanger networks 62
 - heat of vaporization (ΔH_{VAP}) 43
 - heavy cycle oil (HCO) 186
 - heavy naphtha 130, 206, 268, 275, 406, 448
 - heavy straight run (HSR) naphtha 65
 - heavy vacuum gas oil (HVGO) 148
 - Hessian parameters 252, 368
 - HF alkylation process 527
 - H2HC ratio 313
 - high heating value (HHV) 5
 - high-octane components, in gasoline products 189
 - high-pressure HCR (HP HCR) 411
 - LPG composition and distillation curves 459–461
 - performance of fractionators 455
 - process flow diagram of 419
 - product property 462–464
 - product yields 455–459
 - reactor and hydrogen recycle system 454–455
 - reactor model
 - equivalent reactor 431–432
 - procedures 430
 - reconciliation of 432–435
 - high-pressure separator (HPS) 419
 - hydrocarbon-hydrocarbon interactions 45
 - hydrocracking (HCR) 406
 - calibrating preliminary model to match plant measurement 481–497
 - case studies 497–505
 - complexity of petroleum oil 407
 - data acquisition 421

- hydrocracking (HCR) (*contd.*)
 - delta-base vector generation 468–471
 - flow diagram of 406
 - fractionation system 505–512
 - HP HCR unit 411, 419
 - hydrogen partial pressure 464
 - integrated HCR model 419–421
 - lumping techniques 407, 408
 - mass balance 421–423
 - MP HCR unit 411, 416–419
 - preliminary reactor model 471–481
 - product property correlation 442
 - reactor model development, *see* Reactor model development
 - three-layer onion 407
 - VGO 406
 - WART versus feed flow rate versus product distribution 466–468
 - hydrocracking reactions 310
 - hydrodenitrogenation (HDN) 413, 415
 - hydrodesulfurization (HDS) 408, 413, 414
 - hydrofluoric acid alkylation process
 - simulation 519–527
 - hydrogen balance 329
 - hydrogen consumption 415, 444, 464
 - hydrogenation 311
 - hydrogenolysis 311
 - hydrogen-to-hydrocarbon ratio 366
 - hydrogen transfer reactions 518
 - hydroprocessing units, HCR, *see* hydrocracking (HCR)
 - hydrotreating and hydrocracking process 309
 - hypothetical components 1, 93
- i**
- iButane recycle loop 523
 - ideal gas heat capacity 42–43
 - ignition 52
 - incomplete distillation curve 13
 - index-based approach 51
 - inhibitors 416
 - initial boiling point (IBP) 5, 352
 - input assay 22
 - inside-out algorithm 69–71
 - interaction parameters 239
 - integrated fluid catalytic cracking (FCC)
 - process, *see* fluid catalytic cracking (FCC) unit
 - interconvert distillation curves 13
 - intrinsic rate constant 415
 - isenthalpic/isobaric flashes 47
 - isomerization reactions 189
 - iteration spreadsheet for MeABP calculation 11
- j**
- Jacobian 229, 252, 351, 542
 - jet fuel 5, 52, 406, 418, 461
- k**
- kinetic coke 198
 - kinetic lump compositions 529
 - kinetic models and networks 317
 - Krane's model 315
- l**
- Langmuir-Hinshelwood-Hougen-Watson (LHHW) mechanism 414
 - Lee-Kesler EOS 37
 - Light components 21–28
 - light cycle oil (LCO) 186, 233, 235
 - light ends tuning 332
 - light gas oil (LGO) 65, 115
 - light naphtha 29, 54, 64, 91, 106, 114, 124, 206, 406, 447, 449
 - light straight run (LSR) naphtha 65
 - line search parameters 252, 368
 - linear free energy relationships (LFER) 317
 - linear programming (LP)
 - based planning 183, 542
 - methods 226
 - techniques 350
 - liquid petroleum gas (LPG) 303, 449
 - lognormal distribution 205
 - lower heating value (LHV) 5
 - lubricant production 147
 - lumped kinetic model 190
 - lumping based on molecular composition

- Aspen HYSYS Petroleum Refining
 - hydrocracker model, *see* Aspen HYSYS petroleum refining hydrocracker model
 - reactor hydrodynamics 411
 - SOL technique 408
- lumping based on nonmolecular composition
 - key features of 409–411
- 21-lump kinetic model 197–198
- LVGO (light vacuum gas oil) 148, 170, 177, 544

- m**
- main fractionator temperature profile 217
- mass balance 70, 142, 263, 329, 423
- material, equilibrium, summation and heat(MESH) equations 66
- mean average boiling point (MeABP) 10–20, 208, 436
- mechanistic FCC models 192
- medium-pressure HCR (MP HCR)
 - description of 416–419
 - distillation curves of liquid products 449–451
 - performance of fractionators 445
 - product property 451–454
 - product yields 447–449
 - reactor and hydrogen recycle system 444–445
 - unit 411
- medium-pressure (MP) steam 543
- mercaptan sulfur 2
- MESH equations
- metal coke 198
- metal functions, catalysts 312
- metal content, catalysts 210, 236, 259
- methane
- methanol-to-olefins (MTO) 317
- methyl mercaptan 2
- methylcyclohexane (MCH) 346
- methylcyclopentane (MCP) 346
- minimal pseudocomponents properties
 - estimation
 - critical properties 38–40
 - ideal gas heat capacity 42–43
 - liquid density 40–42
 - mixed or activity-coefficient approach 47–49
 - molecular weight 37–38
 - physical properties 43–45
 - process thermodynamics 45–50
 - mixed or activity-coefficient approach 47
- model applications
 - atmospheric distillation unit 126, 129
 - continuous catalyst regeneration reforming 395
 - delayed coking 542
 - fluid catalytic cracking 285, 291
 - hydrocracking 495
 - production planning 291, 468, 542
 - refinery-wide simulation 551
 - vacuum distillation unit 171
- modified HYSYS inside-out algorithm 70, 71
- molal average boiling point (MABP) 10
- molecular-type homologous series (MTHS) 412
- molecular weight 323
- motor octane number (MON) 6, 517
- moving-bed catalyst regeneration 305
- Murphree stage efficiency 200, 440
- Murphree vapor stage efficiency 67, 68

- n**
- naphtha or unstabilized gasoline 529
- naphthene content 207
- net heat of combustion, *see* lower heating value (LHE)
- Newton-Raphson method 70
- nitrogen content 529
- normal distribution function 328
- nonlinear programming (NLP) 226

- o**
- objective function 253, 264, 332, 369, 381, 385, 425, 486
- octane number 6, 366, 517

- oil fractions, thermodynamic properties
 - Aspen HYSYS petroleum refining
 - new petroleum assay manager 25–32
 - old oil manager 16–25
 - boiling point based
 - hypothetical/pseudocomponent generation 8–12
 - crude assays
 - bulk properties 2–6
 - fractional properties 6–7
 - interconversion of distillation curves 7
 - incomplete distillation curve 13
 - interconvert distillation curves 13
 - refinery process models, property requirements 33
 - oil manager vs. petroleum assay
 - manager conversion 32–33, 35
 - olefins 262, 311
 - on stage convention 65
 - organic nitrogen compounds 414
 - overall column (stage) efficiency 67
 - overcracking 291
 - overhead gas compressor 183
 - overhead wet gas system 276
 - overflash 62, 111
- p**
- paraffin content 206
 - paraffin-naphthene-aromatic (PNA)
 - content 6, 50, 53, 317, 320, 325–328, 331, 363, 372, 373, 529
 - pathway models 192, 317
 - Peng-Robinson (PR) equation of state (EOS) 49
 - petroleum assay 521
 - petroleum assay manager improvement 35
 - petroleum distillation column 140–144
 - petroleum fractions 1
 - petroleum shift reactors 542, 553
 - physical properties
 - minimum properties for pseudocomponents 35
 - oil fractions 2, 6
 - required properties for process modeling (simulation) 46
 - thermodynamic approaches 47
 - PIMS (process industry management system) 226, 291–297, 470, 549
 - pinch technology 62
 - pinning 321
 - platinum 311
 - plug-flow reactor (PFR) 318
 - post-convergence 104
 - pour point 2
 - Poynting correction factor 48
 - prefractionation units 87
 - preheat train 63
 - preheater 90, 391
 - primary absorber temperature profile 218
 - primary alkylation reactions 518
 - primary stripper temperature profile 217
 - probability distribution 10, 203
 - profit margin analysis 548
 - process chemistry
 - alkylation 518
 - continuous catalyst regeneration
 - reforming 311
 - delayed coking 529
 - fluid catalytic cracking 188
 - hydrocracking 411
 - process flow diagram (PFD) *see* flow diagram
 - process optimization
 - continuous catalyst regeneration
 - reforming 395
 - delayed coking 542
 - fluid catalytic cracking 285, 291
 - hydrocracking 497
 - model applications 126, 129, 131, 140, 172, 285, 291, 395, 497, 519, 542
 - VDU deep-cut operation 172
 - process thermodynamics 45–50
 - property package 235
 - pseudocomponents 72
 - commercial process simulators 9
 - generation 8–12
 - properties vs. TBP curve 9

- pumparounds
 - atmospheric distillation unit 99
 - fluid catalytic cracking 273
 - hydrocracking 510
 - vacuum distillation unit 168
 - purge gas 406
- r**
- Rackett parameter 41
- Raoult's law 47
- Ramsbottom carbon residue 5
- rate-based approach 65
- reaction classes
 - alkylation 518
 - continuous catalyst regeneration
 - reforming 311
 - delayed coking 529
 - fluid catalytic cracking 189
 - hydroprocessing units 416
- reaction network 413–415
- reactor inlet temperature 349
- reactor model development 424
 - delumping, *see* delumping
 - HP HCR process 430–435
 - MP-HCR 424–430
 - reactor-regenerator unit 185
- reactor temperature specifications 366
- recontactor 389
- Redlich-Kwong (RK) EOS 49
- refinery production planning 225, 350, 354
 - LP DELTA-BASE vector generation 291–297
- refinery process models, property requirements 33
- refinery reactor models, Aspen HYSYS 552
- refinery-wide process simulation
 - deploys 551–553
 - developing tools 551
 - fractionation model 549
 - integrating process model 548–549
 - reactor models 549
 - simulation model 548–549
- refractive index, ASTM D1218 5
- RefSYS 245, 247, 477
- regeneration timescale 308
- regenerator 258, 266
- Reid vapor pressure (RVP) 392
- research octane number (RON) 6, 517
- residence time 287
- residual Hessian parameters 252, 368
- residue-type feeds 243
- rhenium 311
- Riazi-Daubert correlation 53
- rigorous model
 - continuous catalyst regeneration
 - reforming 354, 376, 387
 - delta-base vectors 191, 468
 - fluid catalytic cracking 267–285
 - vacuum distillation unit 165
- rigorous VDU simulation model 154, 165–172
- ring dealkylation 415
- riser outlet temperature (ROT) 220, 221
- s**
- secondary alkylation reactions 518
- semiregenerative processes 305
- side strippers 67, 68, 95, 272, 507
- side-chain scission 189
- simplified model, VDU 157
- simulation
 - alkylation 519
 - atmospheric distillation unit 77, 120
 - continuous catalyst regeneration
 - reforming 354, 376, 387
 - delayed coking 530
 - fluid catalytic cracking 231, 258, 267
 - hydrocracking 471, 481
 - vacuum distillation unit 157, 165
 - refinery plant-wide 157
- simulation basis manager 232, 233, 235, 473
- single-event approach 316
- slip factor 196–197
- smoke point 5
- Soave-Redlich-Kwong (SRK) 49, 358, 474
- SOLVER method 204, 205
- solver parameters 90, 368
- specific gravity (SG) 2
- Spencer-Danner method 42

- sponge oil absorber temperature profile 219
 - spreadsheet
 - distillation curve conversion 13
 - HCR mass balance 421
 - make-up gas streams, VDU 152
 - MeABP calculation 13
 - square cut yields 255
 - stabilizer 392, 538
 - stage efficiency, fractionation
 - atmospheric distillation column 69
 - fluid catalytic cracking 201
 - hydrocracking 440
 - reformer 324
 - stage-by-stage model 201, 240
 - structure-oriented lumping (SOL)
 - 192, 408
 - sulfides 2
 - sulfur content
 - fluid catalytic cracking 225, 246
 - gasoline 224
 - hydrocracking 426, 470
 - oil fractions 6
 - superficial gas velocity 197
- t**
- T_c correlation 39
 - ten-lump model 191
 - thermodynamic approaches required
 - physical properties and recommendation 46
 - thermal cracking
 - delayed coking 528
 - fluid catalytic cracking 189, 291
 - vacuum distillation unit 153
 - thermophysical properties 323
 - thiols 2
 - three-layer onion hydroprocessing unit
 - modeling 408
 - toluene 346
 - 2–2–4-trimethylpentane (224TMP) 6
 - true boiling point (TBP) 7, 326, 328
 - twenty-one-lump kinetic model FCC 197
 - Twu correlation 37
 - typical crude assay 3
- u**
- unit-level models 193, 317–319
 - Universal Oil Products (UOP)
 - CCR process 305
 - design, FCC 185
 - utility consumption 349, 542
- v**
- vacuum distillation 7
 - vacuum distillation units (VDUs)
 - 147
 - absorbers 155
 - atmospheric residue, representation of 149–152
 - data requirement 149
 - deep-cut operation 172
 - high-temperature operations 152
 - light gases, source of 153
 - operation types 147
 - plant data and modeling approaches 155–157
 - process flow diagram 148
 - product distribution 154
 - rigorous simulation model 154, 165–172
 - simplified and rigorous simulations 155
 - simplified VDU model 154, 157–165
 - in Southeast Asia 156
 - wet operating conditions 148
 - validation
 - atmospheric distillation unit 73
 - continuous catalyst regeneration
 - reforming unit 334, 487
 - fluid catalytic cracking 209–217, 263
 - vanadium contaminants 3
 - vapor enthalpy 66
 - vapor-liquid equilibrium in distillation 8
 - vapor pressure 43
 - viscosity gravity constant (VGC) 205
 - viscosity gravity factor (VGF) 205
 - volatility 69

W

wash grid 148
water draw stream 120–122
water wash 188
Watson K factor
 atmospheric distillation column 79
 delayed coking 529
 hydrocracking 436
 oil fractions 10–12
 PNA contents 530
Weight-average boiling point (WABP)
 8
weight-averaged bed temperature
 (WABT) 321, 360
weight-averaged inlet temperature
 (WAIT) 313, 321, 360, 366
weight-average reactor temperatures
 (WARTs) 444
weighted-average reactor inlet
 temperature (WAIT) 341, 345
weight hourly space velocity (WHSV)
 321, 345

weighting factors

 for reformer model calibration 332,
 382
 for property index mixing 51
wet gas compressor 187
what-if-scenario
workflow *see also* flowchart, flow
 diagram

X

xylene 310, 338, 347, 380

Y

yields
 alkylation 523
 atmospheric distillation column 105
 backblending 105
 continuous catalyst regeneration
 reforming 337, 341, 348
 fluid catalytic cracking 287, 291
 hydrocracking 447
 vacuum distillation unit 167

