

Index

- absolute humidity, 207
absolute zero, 20
adiabatic, 45
Amagat's Law, 64
annular fins, 358
approximate rate of return, 569
Archimedean Screw, 4
atomic mass units, 22
atomic weight, 22
Avogadro's Number, 22
baffle design, 321
ball valve, 76
BASIC 543
batch process, 41
Bessel function, 113
Biot Number, 153, 361, 370
black body, 183, 185
Blasius Equation, 144
blowdown, 42
boiler, 202
boiling crisis point, 220
boiling point elevation, 217
boiling, 201, 216
Bond Number, 202
bonds, 570
Boyle's Law, 56
brainstorming, 593
break even point, 569
Briggs Equation, 175
Buckingham Pi, 33
buoyancy, 161
burnout point, 220
bushing, 77
BWG number, 73
bypass, 41
C ++ 543
caloric theory, 3
capacitance rate, 307
capital recovery factor, 567
cellular insulation, 430
Celsius Scale, 20
centipoise, 25
Charles' Law, 56
check valve, 76
chemical properties, 16
circumferential fins, 358
Clausius inequality, 252
Clean Air Act, 506
cleaning, 446
clearance provisions, 444
co-current flow, 265, 284
coefficient of performance, 246
coefficient of volumetric expansion, 162
compound interest, 565
Comprehensive Environmental Response,
Compensation, and Liability Act
(CERCLA) 506
compressibility factor, 65
condensate loading, 327
condensation number, 202, 211
condensation, 201, 209
condenser, 202, 401
conduction, 29, 85
conservation law for energy, 45
conservation law for mass, 41
conservation law for momentum, 38
conservation law, 11, 38
continuous process, 41
controlling resistance, 272
convection, 85, 131
convective heat transfer coefficient, 141
correlation coefficient, 557
Council for Environmental Quality
(CEQ) 494
counter flow, 266, 284

- coupling, 77
creativity, 592
critical insulation thickness, 431
critical thinking, 592
cryobiology, 231
cryogenics, 230
cryopreservation, 231
cryopumping, 231
cryosurgery, 231
- Dalton's Law, 63
Davidson Bryant Equation, 176
Davis, George, 8
decision tree, 525
degress of freedom, 205
density, 23
depreciation, 567
design method, 19
dew point, 207
Dewar vessel, 237
diffuse reflection, 184
dimensional analysis, 19
dimensional consistency, 16
direct contact condensation, 204, 210
Dittus Boelter Equation, 146, 150, 288, 297, 325
dose response, 502
double pipe heat exchanger, 261, 281
dropwise condensation, 204, 210
dry adiabatic lapse rate, 172
dry bulb temperature, 208
dynamic similarity, 33
- effectiveness factor, 304, 344
elbow, 77
entrainment, 174
Environmental Protection Agency (EPA) 494
equivalent diameter, 283
ethics, 533
evaporator, 382
exact rate of return, 569
extensive properties, 16
external gas pressurization, 240
- F factor, 328
fabricated equipment cost index, 567
Farenheit Scale, 20
fiber insulation, 430
- film boiling, 216
film condensation, 204, 210
fin effectiveness, 371
fin efficiency, 361, 372
fin performance coefficient, 371
fin pitch, 371
finish, 430
fire tube boiler, 393
fitting, 77
flake-type insulation, 430
fluid, 19
foamed insulation, 430
forced convection, 131
forced convection, 216
FORTRAN 543
fouling factor, 324
fouling, 271
foundations for heat exchangers, 444
Fourier series analysis, 112
Fourier, Joseph, 4
Fourier's Law of Induction, 4
Fourier's Law, 87
free convection, 131, 161
- Ganapathy Method, 395
gate valve, 76
Gauss elimination, 551
gc, 17
geometric similarity, 33
Gibbs Phase Rule, 205
globe valve, 76
Graetz Number, 35, 325
Grashof Number, 162
gray surface, 184
- hairpin, 281
hazard risk assessment, 510
heat capacity, 27
heat exchanger design, 465
heat exchanger operation, 445
heat exchanger purchase, 468
heat exchangers, 257
heat flux, 268
heat transfer coefficient, 133, 137, 138
heat transfer equation, 278
heat, 47
Holland Equation, 175
homogeneous condensation, 204, 210
hydrostatic pressure difference, 21

- ideal gas constant, 58
- ideal gas law, 55
- ideal gas, 55
- incremental cost, 570
- individual film coefficient, 132
- inquiring minds, 594
- inspection, 446
- intensity, 180
- intensive properties, 16
- internal energy, 46
- inversions, 173
- IPS (iron pipe size) 67
- isobaric, 45
- isochoric, 45
- isothermal, 45
- isotropic, 90

- Jakob Number, 202, 218
- JAVA 543
- Joule, James, 3
- Joule-Thompson Effect, 231
- Joule-Thompson Valve, 234

- Kelvin, 20
- kinetic energy, 31, 46
- kinetic theory, 3
- Kirchoff's Law, 185
- Knudsen and Katz Equation, 148

- laminar flow, 30, 80
- Laplace, 125
- lapse rate, 171
- Lavoisier, Antoine, 3
- Leidenfrost phenomenon, 217
- Leidenfrost point, 220
- leveling of heat exchangers, 444
- liquefaction, 231
- liquid metal flow, 147
- liquid oxygen, 232
- log mean temperature difference, 263
- longitudinal fins, 358
- lower flammability limit (LFL) 514

- Mach Number, 144
- maintenance, 446
- makeup, 42
- maximum financial return, 564
- Maxwell Planck Equation, 182
- mean film temperature, 148

- mechanical pumping, 240
- mole fraction, 23
- molecular weight, 22
- moles, 22
- Mollier chart, 208

- National Environmental Policy Act (NEPA) 494
- Newton, Sir Isaac, 3
- Newton's Law of Cooling, 3, 133
- noncircular conduit, 78
- Norton, Lewis, 8
- NPS (nominal pipe size) 67
- nucleate boiling, 216, 219
- number of transfer units, 308, 344
- Nusselt Number, 34, 162, 325

- Occupational Safety and Health Act, 506, 507
- OPEC 451
- optimization, 448, 560
- overall heat transfer coefficient, 268, 324
- overall surface effectiveness, 372

- parallel flow, 265
- partial differential equations, 544
- partial film boiling, 220
- partial pressure, 63
- partial volume, 64
- PASCAL 543
- path, 37
- peg fins, 358
- perpetual life, 568
- Perry, John H. 10
- perturbation studies, 560
- physical properties, 16
- pipes, 67
- piping considerations, 444
- plug, 77
- plume rise, 173
- pool boiling, 216
- pool convection, 216
- potential energy, 32, 46
- powder insulation, 430
- Prandtl Number, 35, 162
- present net worth, 568
- present worth, 566
- pressure, 20
- principles of accounting, 571
- procedure-oriented language (POL) 542

- process schematics, 466
psychrometric chart, 207
purge, 42
- quality of energy, 452
quantum mechanics, 11
quencher, 404
- radiation, 86, 177
Rankine Cycle, 250
Rankine, 20
Rayleigh Number, 162
real gas, 65
recuperators, 257
recycle, 42
reducer, 77
reflective insulation, 430
refractory, 435
refrigeration, 228
regenerative thermal oxidizers, 405
regression analysis, 554
relative humidity, 207
resistance, 90
Resource Conservation and Recovery Act (RCRA) 506
Reynolds Number, 30, 33, 35, 80
risk management program, 509
- saturated boiling, 216
Saybolt viscometer, 25
Seban and Shimazaki Equation, 147
second law of thermodynamics, 452
Seider Tate Equation, 153, 288, 325
self pressurization, 240
Shakespeare, 292
shear stress, 19
shell and tube heat exchanger, 315
shell-balance approach, 12
shut down, 446
simple interest, 565
SN (schedule number) 67
Society of Chemical Engineers, 8
solvent vapor zone, 484
specific heat, 27
specific volume, 23
specular reflection, 184
spine fins, 358
Srurinski Correlation, 148
startup, 446
- statistical mechanics, 11
steady state conduction, 102
steady state, 41
steam traps, 5
Stefan-Boltzmann Law, 185
stop valve, 76
STP 60
sublimation, 21, 209
Superfund Amendments and Reauthorization Act (SARA) 506, 507
surface condensation, 204, 210
surroundings, 37
system, 37
- teaching ethics, 534
tee (T) 77
temperature approach, 262, 284
temperature difference driving force, 284
temperature, 19
testing, 447
the heat exchanger dilemma, 455
thermal conductivity, 28, 88
thermal diffusivity, 30, 90
thermal efficiency, 248
Thompson, Benjamin, 3
total emissive power, 181
transient, 115
transition film boiling, 220
transport equations, 12
transverse fins, 358
tube corrugation, 320
tubes, 73
Tubular Exchanger Manufacturers Association (TEMA) 316
turbulent flow, 30, 80
- union, 77
Unit Operations, 10
units, 16
unstable film boiling, 220
unsteady state, 41, 115
upper flammability limit (UFL) 514
- valves, 75
vapor pressure, 21
view factors, 197
viscosity, 25
Visual Basic, 543

- waste heat boiler, 392
- water tube boiler, 393
- wet bulb temperature, 208
- wetted perimeter, 284
- Wilson's Method, 309
- work, 47
- weye (Y) 77
- zirconia, 435
- Zuber Equation, 220