

## CHAPTER 10 Useful Lists

The list of tables and figures have been included to provide an alternate way of locating tables and figures throughout the guide. The list of symbols used in equations provides all of the symbols used in equations within the book and gives the definition and unit as it appears in the identified equation.

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### List of Symbols Used in Equations

Symbol	Definition	Unit	EQ #
A	thermal expansion factor	lb/gal/100°F	3
B	hydrostatic compression factor	lb/gal/1000 psi	4
BHP <sub>s</sub>	safe bottomhole pressure	psi or lb/in <sup>2</sup>	1, 4
BHT	bottomhole temperature	°F	3
C	capacity	bbbl/ft	25, 29
C	capacity of hole or pipe	bbbl/ft	26
C <sub>an</sub>	capacity of annulus	bbbl/ft	16, 17, 28
C <sub>an</sub>	capacity of annular space per linear foot	bbbl/ft	27
C <sub>an+t</sub>	combined annular + tubing capacity	bbbl/ft	6
CF	correction factor	(lb/gal)/°F	10
C <sub>p</sub>	averaged pressure correction	lb/gal	4, 5
C <sub>T</sub>	averaged temperature correction	lb/gal	3, 5
C <sub>t</sub>	capacity of tubing	bbbl/ft	16, 17, 18, 21
d	density of fluid in well	lb/gal	19, 20
d <sub>1</sub>	density of starting fluid	lb/gal	7
d <sub>1</sub>	density of fluid 1	lb/gal	9, 11, 14, 15
d <sub>2</sub>	density of added fluid	lb/gal	7
d <sub>2</sub>	density of fluid 2	lb/gal	9, 11
d <sub>c</sub>	density corrected for T and P	lb/gal	5
d <sub>c</sub>	fluid density, corrected to 60°F	lb/gal	10
d <sub>dil</sub>	final desired density	lb/gal	15
d <sub>dil</sub>	density of diluted fluid	lb/gal	12
d <sub>f</sub>	density of final target fluid	lb/gal	7
d <sub>f</sub>	density of final fluid	lb/gal	9, 11, 14
d <sub>n</sub>	density of fluid n in annulus	lb/gal	30
d <sub>slug</sub>	density of slug fluid	lb/gal	20
d <sub>u</sub>	fluid density, uncorrected for T and P	lb/gal	2
d <sub>u</sub>	uncorrected density from Equation 2	lb/gal	5
d <sub>w</sub>	density of fresh water	lb/gal	10

Symbol	Definition	Unit	EQ #
grad	pressure gradient	psi/ft	2
grad <sub>s</sub>	safe pressure gradient	psi/ft	1
h	total length of tubing	ft	18
h	length of hole or pipe	ft	26
h	length of annulus	ft	28
h <sub>bal</sub>	length of pill planned	ft	16, 17, 18
h <sub>dry</sub>	length of dry pipe	ft	19
h <sub>n</sub>	true vertical length of coverage of fluid n in annulus	ft	30
HR	hydrometer reading at sample temperature	unitless	10
h <sub>slug</sub>	length of slug fluid required	ft	20, 21
ID	inside diameter	in	25
ID	inside (casing, liner) diameter	in	27
ID <sub>casing</sub>	casing ID	in	6
ID <sub>t</sub>	tubing ID	in	6
l	liter	l	22, 23
lb <sub>product</sub>	total product added to the recipe	lb/bbl	13
lb <sub>pure</sub>	weight of pure salt (100% basis) per barrel of original brine	lb/bbl	12
lb <sub>pure</sub>	weight of pure salt (100%)	lb/bbl	13
lb <sub>pure</sub>	weight of salt product per barrel required to weigh up to final fluid density	lb/bbl	14
mg	milligram	mg	22, 23
OD	outside (work string, tubing) diameter	in	27
OD <sub>t</sub>	tubing OD	in	6
P <sub>an</sub>	hydrostatic pressure	psi	30
pct <sub>1</sub>	percent of dissolved salt in fluid 1	wt fraction	15
pct <sub>dil</sub>	percent of pure salt (100% basis) in diluted brine	wt fraction	12
pct <sub>dil</sub>	percent of dissolved salt in final fluid	wt fraction	15
pct <sub>f</sub>	percent of pure salt (100% basis) in original brine	wt fraction	12
P <sub>dif</sub>	pressure differential	psi	19, 20
ppm	parts per million	10 <sup>-6</sup>	22, 23, 24
P <sub>sol</sub>	solid content	vol %	31
purity	weight percent as decimal fraction	unitless	13
Q	flow rate	bbl/min	29, 31
SG	specific gravity	unitless	22, 23
surf	surface temperature	°F	3
TVD	true vertical depth	ft	1
v <sub>1</sub>	volume of starting fluid	bbl	7, 8
v <sub>1</sub>	volume of fluid 1	bbl	9, 11
v <sub>1</sub>	volume (as a fraction of a barrel) of fluid 1	bbl	15
v <sub>2</sub>	volume of added fluid	bbl	7, 8
v <sub>2</sub>	volume of fluid 2	bbl	11
v <sub>an</sub>	total volume of annulus with pipe/tubing in well	bbl	28

Symbol	Definition	Unit	EQ #
$V_{chase}$	volume of chase fluid	bbl	18
$Vel$	velocity	ft/min	29
$V_f$	volume of final target fluid	bbl	8
$v_f$	final volume	bbl	14
$V_{pill}$	volume of balanced pill	bbl	16, 17
$V_{slug}$	volume of slug	bbl	21
$V_{sol}$	volume of solid removal rate	ft <sup>3</sup> /min	31
$V_{surf}$	volume of empty lines from pit to drill floor	bbl	18
$V_{tot}$	total volume of hole or pipe	bbl	26
wt %	weight percent	10 <sup>-2</sup>	24
$\Delta T$	sample temperature – 60°F	°F	10
0.052	units conversion factor	gal/in <sup>2</sup> -ft	2, 19, 20, 30
0.056	units conversion factor	ft <sup>3</sup> /(bbl-%)	31
1029.4	units conversion factor	in <sup>2</sup> -ft/bbl	6, 25, 27

**Notes:**