

## DAFTAR ISI

LEMBAR PENGESAHAN	ii
PERNYATAAN KEASLIAN KARYA ILMIAH	iii
HALAMAN PERSEMBAHAN	iv
PRAKATA	v
RINGKASAN	vi
ABSTRACT	vii
DAFTAR ISI	viii
DAFTAR GAMBAR	xii
DAFTAR TABEL	xiii
DAFTAR LAMPIRAN	xiv
DAFTAR SINGKATAN DAN LAMBANG	xv
BAB I PENDAHULUAN	1
I.1    Latar Belakang	1
I.2    Maksud dan Tujuan	2
I.3    Batasan Masalah	2
I.4    Metodologi	2
I.4.1    Pengumpulan data	2
I.4.2    Analisis data Logging	3
I.4.3    Penentuan Model Geomekanik 1D	3
I.5    Sistematika Penulisan	5
BAB II TINJAUAN LAPANGAN	7
II.1    Letak Geografis Tinjauan Geologi Lapangan	7
II.2    Tinjauan Geologi Lapangan	7
II.2.1    Geologi Regional	8
II.2.2    Stratigrafi Lapisan	9
II.2.3 <i>Petroleum System</i>	10
II.2.3.1    Batuan Induk ( <i>Source Rock</i> )	10
II.2.3.2 <i>Reservoir</i>	11

II.2.3.3 <i>Trap</i>	11
II.2.3.4 Batuan Penutup ( <i>seal</i> )	11
II.2.3.5 Migrasi	11
II.3 Data Sumur	12
<b>BAB III DASAR TEORI</b>	<b>17</b>
III.1 Karakteristik Batuan Bawah Permukaan	17
III.1.1 Sifat Fisik Batuan	17
III.1.1.1 <i>Gamma Ray Log Analysis</i>	18
III.1.1.2 Analisis <i>Sonic Log</i>	19
III.1.1.3 Analisis <i>Density Log</i>	20
III.1.2 Sifat Mekanika Batuan	21
III.1.2.1 <i>Stress dan Strain</i>	21
III.1.2.2 <i>Rock Strength Properties</i>	22
III.1.2.2.1 <i>Compressive Strength</i>	23
III.1.2.2.2 <i>Friction Angle</i>	24
III.1.2.3 <i>Rock Elastic Properties</i>	26
III.1.2.3.1 <i>Poisson's Ratio</i>	27
III.1.2.3.2 <i>Young Modulus</i>	28
III.1.2.3.3 <i>Brittleness Index</i>	29
III.1.2.3.4 <i>Fracability Index</i>	31
III.2 Tekanan Bawah Permukaan	32
III.2.1 <i>Hydrostatic Pressure</i>	32
III.2.2 <i>Overburden Pressure</i>	33
III.2.3 <i>Pore Pressure</i>	33
III.2.3.1 Tekanan Pori Normal	34
III.2.3.2 Tekanan Pori Abnormal	34
III.2.3.3 <i>Subnormal Pressure</i>	34
III.2.4 <i>Overpressure</i>	35
III.2.5 <i>Fracture Pressure</i>	37
III.2.6 <i>Leak Off Test</i>	38
III.3 <i>Horizontal Stress</i>	39
III.3.1 <i>Minimum Horizontal Stress</i>	40

III.3.2 <i>Maximum Horizontal Stress</i>	41
III.4 <i>Shear Failure Gradient</i>	41
III.5 <i>Wellbore Stability</i>	42
III.5.1 Penyebab <i>Wellbore Instability</i>	42
III.5.1.1 Faktor Alami <i>Wellbore Instability</i>	43
III.5.1.1.1 Formasi yang Rekah atau Patah Secara Alami	43
III.5.1.1.2 <i>Formation Stress</i> secara Tektonik	44
III.5.1.1.3 <i>In-situ Stress</i> yang Tinggi	45
III.5.1.1.4 <i>Mobile Formation</i>	45
III.5.1.1.5 Formasi <i>Unconsolidated</i>	46
III.5.1.1.6 <i>Naturally Overpressured Shale Collapse</i>	46
III.5.1.1.7 <i>Induced Overpressured Shale Collapsed</i>	47
III.5.1.2 Faktor yang Dapat Dikontrol saat <i>Wellbore Instability</i>	48
III.5.1.2.1 Tekanan Dasar Sumur	48
III.5.1.2.2 Inklinasi Sumur dan <i>Azimuth</i>	48
III.5.1.2.3 <i>Transient Wellbore Pressure</i>	49
III.5.1.2.4 Interaksi Fisik atau Kimia Fluida Batuan	49
III.5.1.2.5 Vibrasi <i>Drillstring</i>	49
III.5.1.2.6 <i>Temperature</i>	50
III.5.2 Indikator <i>Wellbore Instability</i>	50
III.5.3 <i>Hole Problem</i>	50
III.5.3.1 <i>Lost Circulation</i>	51
III.5.3.1.1 Penyebab <i>Lost Circulation</i>	51
III.5.3.1.2 Pencegahan <i>Lost Circulation</i>	52
III.5.3.1.3 Jenis-Jenis <i>Lost Circulation</i>	53
III.5.3.2 <i>Kick</i>	53
III.5.3.2.1 Penyebab <i>Well Kick</i>	53
III.5.3.2.2. Pencegahan <i>Well Kick</i>	55
III.6 Konsep <i>Safe Mud Window</i>	57
III.7 <i>Perdict Drillwork Software</i>	59
BAB IV PERENCANAAN EVALUASI SAFE MUD WINDOW PADA SUMUR “AN-02”	61

IV.1	Data Sumur "AN-02"	61
IV.2	Data <i>Logging</i> Sumur "AN-02"	61
IV.3	Penarikan <i>Shale Base Line</i> pada <i>Gamma Ray</i>	62
IV.4	Penentuan <i>Rock Mechanics</i>	64
IV.4.1	<i>Compressional Velocity</i>	65
IV.4.2	<i>Shear Velocity</i> (Castagna, 1985)	65
IV.4.3	<i>Poissons Ratio</i> (Christensen and Castagna, 1985)	65
IV.4.4	<i>Young Modulus</i>	65
IV.4.5	<i>Friction Angle</i> (Lal, Vp)	66
IV.4.6	<i>Cohessive</i> (Lal)	66
IV.4.7	<i>Brittleness Index</i>	66
IV.4.8	<i>Fraccability Index</i>	66
IV.5	Penentuan <i>Geopressure</i>	69
IV.5.1	Penentuan <i>Overburden Stress</i>	69
IV.5.2	Penentuan <i>Pore Pressure</i>	71
IV.5.3	Penentuan <i>Fracture Pressure</i>	73
IV.6	Penentuan <i>Horizontal Stress</i>	74
IV.7	Penentuan <i>Shear Failure Gradient</i>	77
IV.8	Analisi Geomekanik Sumur "AN-02"	78
IV.9	Evaluasi <i>Lost Circulation</i>	79
BAB V	KESIMPULAN	82
DAFTAR	RUJUKAN	83
LAMPIRAN		85