

## REFERENCES

- (1) J.D.Clegg, S.M.Bucaram and N.W.Hein Jr. 1993. Recommendations and Comparisons for Selecting Artificial-Lift Methods. JPT, December.
- (2) Naguib and Shaheen. 2000. Review of Artificial Lift in Egypt. SPE 64508 paper presented SPE Asia Pacific Oil and Gas Conference and Exhibition, Brisbane, Australia. October.
- (3) Brinkhorst. 1998. Successful application of high GOR ESPs in the Lekhwair Field. SPE 49466 paper presented at Abu Dhabi International Petroleum Exhibition and Conference, Abu Dhabi, UAE. November.
- (4) Naguib and Bayoumi. 2000. Guideline of Artificial Lift Selection for Mature Field. SPE 64428 paper presented at SPE Asia Pacific Oil and Gas Conference and Exhibition, Brisbane, Australia. October.
- (5) H.Dale Beggs. (n.d.). Production Optimization Using Nodal Analysis. USA: Oil and Gas Consultants International, Inc.
- (6) Thomas O. Allen and Alan P.Roberts. 1997. Production Operations Fourth Edition. USA: Oil and Gas Consultants International, Inc.
- (7) [www.itl.nist.gov](http://www.itl.nist.gov)
- (8) H.K.Lee. 1988. Computer Modeling and Optimization for Submersible Pump Lifted Wells. SPE 17586 paper presented at the SPE International Meeting on Petroleum Engineering held in Tianjin, China. November.
- (9) B.L.Wilson, John Mack and Danny Foster. (n.d.). Operating Electrical Submersible Pumps below the Perforations. SPE 37451 Journal Production and Facilities.
- (10) D.J. Galles and J.B.Larson. 1996. Optimized Electrical Submersible Pumping to Extend Economic Oil Production in a High Water Cut Environment. JPT. January.
- (11) Prasanna V.Mali, Rajiv Singh, S.K.De and M.K.Bhatta. 1999. Downhole ESP & Surface Multiphase Pump – Cost Effective Lift Technology for Isolated and Marginal Offshore Field Development. SPE 54375 paper presented at SPE Asia Pacific Oil and Gas Conference and Exhibition in Jakarta, Indonesia. April.

- (12) G.C.Bihn and E.H.Utomo. 1989. Electrical Submersible Pump Optimization in the Bima Field. SPE 19495 paper presented at Asia Pacific Conference in Sydney, Australia. September.
- (13) Michael Golan and Curtis H. Whitson. (n.d.). Well Performance. Second Edition, New Jersey, USA: Prentice Hall.
- (14) Luud Dorrestijn, Thijs Kuiper, Akshay Sahni and Gary Thompson. 2006. ESP Engineering Course. Presented at Bangkok Conventional Center, Thailand. August.
- (15) B.L.Wilson and J.C.Liu. 1985. Electrical Submersible Pump Performance Using Variable Speed Drives. SPE 13805 paper presented at Productions Operations Symposium in Oklahoma City, Oklahoma. March.
- (16) L.P Dake, 1983. Fundamentals of Reservoir Engineering. Seventh Impression, Netherlands: Elsevier Scientific Publishing Company.
- (17) L.E. Buzarde Jr. and R.L. Kastor. (n.d.). Production Operations Course-I Well Completions. USA: Society of Petroleum Engineers.
- (18) Schmidt and Launsby. (n.d.). Understanding Industrial Design Experiments. Fourth Edition, USA: Air Academy Press.

## **APPENDICES**

## Appendix A: Reservoir Parameters

<b>Tank Type</b>	<input type="text" value="Oil"/>	
<b>Name</b>	<input type="text" value="Tank1"/>	
<b>Temperature</b>	<input type="text" value="300"/>	deg F
<b>Initial Pressure</b>	<input type="text" value="3200"/>	psig
<b>Porosity</b>	<input type="text" value="0.2"/>	fraction
<b>Connate Water Saturation</b>	<input type="text" value="0.25"/>	fraction
<b>Water Compressibility</b>	<input type="text" value="Use Corr"/>	1/psi
<b>Initial Gas Cap</b>	<input type="text" value="0"/>	
<b>Original Oil In Place</b>	<input type="text" value="10"/>	MMSTB
<b>Start of Production</b>	<input type="text" value="01/01/2000"/>	date m/d/y

Figure A-1 Basic oil tank parameters

<b>Model</b>	<input type="text" value="Hurst-van Everdingen-Dake"/>	
<b>System</b>	<input type="text" value="Radial Aquifer"/>	
<b>Reservoir Thickness</b>	<input type="text" value="50"/>	feet
<b>Reservoir Radius</b>	<input type="text" value="2000"/>	feet
<b>Outer/Inner Radius ratio</b>	<input type="text" value="5"/>	
<b>Encroachment Angle</b>	<input type="text" value="180"/>	degrees
<b>Aquifer Permeability</b>	<input type="text" value="20"/>	md

Figure A-2 Water influx parameters

<b>Rock Compressibility</b>	<input type="text" value="3.49998e-6"/>	1/psi
-----------------------------	---	-------

Figure A-3 Rock compressibility from correlation

## Appendix B: Well trajectory and Equipment data

	Measured Depth	True Vertical Depth	Cumulative Displacement	Angle
	(feet)	(feet)	(feet)	(degrees)
1	0	0	0	0
2	1090	1090	0	0
3	2410	2174	753.222	34.7937
4	3340	2894	1341.86	39.268
5	4090	3478	1812.44	38.8613
6	4630	3897	2153.09	39.1109
7	5350	4470	2589.06	37.2659
8	5710	4776	2778.7	31.7883
9	6370	5356	3093.66	28.5035
10	6871	5765	3383.01	35.2772
11	8094	6717	4150.75	38.8844
12	8188	6788	4212.35	40.9467
13	9884	8110	5274.77	38.7869
14	9978	8185	5331.43	37.0726
15	10072	8260	5388.1	37.0726
16	10449	8575	5595.23	33.3275
17	10491	8611	5616.86	31.0027
18				

Figure B-1 Well trajectory

Label	Type	Measured Depth	Tubing Inside Diameter	Tubing Inside Roughness	Tubing Outside Diameter	Tubing Outside Roughness	Casing Inside Diameter	Casing Inside Roughness	Rate Multiplier
		(feet)	(inches)	(inches)	(inches)	(inches)	(inches)	(inches)	
1	Xmas Tree	0							
2	Tubing	9750	2.441	0.0006					1
3	Casing	10000					6.184	0.0006	1

Figure B-2 Down-hole equipment

Cp Oil	0.53	BTU/lb/°F
Cp Gas	0.51	BTU/lb/°F
Cp Water	1	BTU/lb/°F

Figure B-3 Average heat capacities

	Formation Measured Depth	Formation Temperature
	(feet)	(deg F)
1	0	60
2	8080	288
3	8241	291
4	8290	292
5	8310	292
6	8678	299
7	8782	301
8	8865	302
9	9252	310
10	9275	311
11	9435	313
12	9476	314
13	9526	315
14	9840	321
15	10315	330

*Figure B-4 Geothermal gradient*

## VITAE

Homme Hansra was born on August 27, 1982 in Songkhla, Thailand. He received his B. Eng. in Mechanical Engineering from the Faculty of Engineering, Sirindhorn International Institute of Technology, Thammasat University in 2005. After graduating, he continued his study in Master of Petroleum Engineering program at the Department of Mining and Petroleum Engineering, Faculty of Engineering, Chulalongkorn University.