

7

Referências Bibliográficas

BIOT, M.A. **General Theory of three Dimensional Consolidation**. Journal of applied physics.1941.

BOWES, C., Procter, R. **Drillers Stuck Pipe Handbook**. Guidelines & Drillers Handbook credits, Schlumberger, Ballater, Scotland, 1997.

BRANDÃO, R. **Engenharia de Perfuração e Completação em Poços de Petróleo**. Petrobras/UM-ES/ATP-JUB-CHT/IP. Florianópolis, 2004.

CHEN, X., TAN, C.P., HABERFIELD, C.M. **A Comprehensive Practical Approach for Wellbore Instability Management**. International conference and exhibition. SPE 48898, China, 1998.

CHEN, X., TAN C.P., DETOURNAY C. **The Impact of Mud Infiltration on Wellbore Stability in Fractured Rock Masses**. Society of Petroleum Engineers, SPE 78241. 2002.

CHEN, X., TAN C.P., DETOURNAY C. **A Study on Wellbore Stability in Fractured Rock Masses with Impact of mud Infiltration**. CSIRO petroleum Australian resource research centre. Journal of petroleum science and engineering. 2003.

CUNDALL, P.A. **Computer modeling of jointed rock masses**. 8th international conference on computer e advances in geomechanics, siriwardance. 1978.

CHOU, C.C and Pagano N.j. **Elasticity Tensor Dyadic and Engineering Approaches**. Van Nostrand Company, 1992.

EATON, B.A. **the Equation for Geopressure Prediction from Well Logs**. 50 th annual fall meeting of the society of petroleum engineers of AIME. SPE 5544. Dallas, Texas, 1975.

EDWARDS, S., MATSUTSUYU, B., WILLSON, S. **Imaging Unstable Wellbores While Drilling**. Society of Petroleum Engineers, SPE 79846. 2004.

FJAER, E., HOLT, R.M., HORSRUD, P., RAAEN, A.M., RISNES, R. **Petroleum Related Rock Mechanics**. Elsevier Science Publishers B.V, 2008.

FONTANA, H. PARIS, M. **Borehole Stability (Geomechanics) Modelling and Drilling Optimization Practices Improve Drilling Curves in Naturally Fractured Shale- A South Argentina Experience**. Society of Petroleum Engineers, SPE 107474. 2007.

GALLANT, C., ZHANG, J., WOLFE C.A., FREMAN, J. **Wellbore Stability Considerations for Drilling High-Angle Wells Through Finely laminated shale: A case Study From Terra Nova**. Society of Petroleum Engineers, SPE 110742. 2007.

GOODMAN, R.E., **Introduction to Rock Mechanics**. Second Edition, University of California at Berkeley, Chapter 5, 1989.

GTPE, **Manual Teórico do SEST Versão 5.51**. Grupo de Tecnologia e Engenharia de Petróleo. 2010.

HEMPHILL T. **Drilling in Fractured Shales: Another Look at the Mud Weight Problem**. American Rock Mechanics Association, ARMA 12-417, 2012.

ITASCA. **UDEC Version 5.0 User's manual**. Minneapolis: Itasca Consulting Group. 2011.

ITASCA. **Lecture: Discontinuum Analysis for Deep Excavations in Jointed Rock**. 1990.

JAEGER, J.C., & COOK, N.G. **Fundamental of Rock Mechanics (Third edition, 361-396pp)**. London Chapman and Hall. 1976.

KANG, Y. **Study of Modeling Transient Borehole Failure Using Discrete Element Method.** University of Tulsa. 2006.

KANG, Y., YU, M., MISKA, S., TAKACH, N.E. **Wellbore Stability: A Critical Review and Introduction to DEM.** Society of Petroleum Engineers, SPE 124669. 2009.

KWAŚNIEWSKI, M. **Testing and Modeling of the Anisotropy of Tensile Strength of Rocks.** *Faculty of Mining and Geology, Silesian University of Technology, Gliwice, Poland,* 2009.

KIRSCH, G. **Die theorie der elastizität und die bedürfnisse der festigkeitslehre.** Zeitschrift des vereines deutscher ingenieure, 1898, 42, 797.

LANG, J., LI S., ZHANG, J. **Wellbore Stability Modelling and Real-Time Surveillance for Deepwater Drilling to Weak Bedding Planes and Depleted Reservoirs.** Society of Petroleum Engineers, SPE 139708. 2011.

MCLELLAN, P. **Assessing the Risk of Wellbore Instability in Horizontal and Inclined Wells.** International conference on recent advances in horizontal well applications, 20-23 March. SPE/CIM/CANMET number HWC94-14. Calgary, Canada, 1994.

MCLELLAN, P.J., CORMIER K. **Borehole Instability in Fissile, Dipping Shales, Northeastern British Columbia.** Society of Petroleum Engineers, SPE 35634. 1996.

MOHR, O. **Welche Umstände bedingen die elastizitätsgrenze und den Bruch eines materials.** Zeit des ver deut Ing 44: 1524-1530. Year: 1900.

NGUYEN, V.X., YOUNANE, N., ABOUSLEIMAN., HOANG S.K. **Analyses of Wellbore Instability in Drilling Through Chemical Active Fractured-Rock Formations.** Society of Petroleum Engineers, SPE 105383. 2009.

NGUYEN, V.X., YOUNANE, N., ABOUSLEIMAN. **Real-Time Wellbore-Drilling Instability in Naturally Fractured Rock Formations with Field Applications.** Society of Petroleum Engineers, SPE 135904. 2010.

NICOLSON, J.P.W., HUNT, S.P. **Distinct Element Analysis of Borehole Instability in Fractured Petroleum Reservoir Seal Formation**. Society of Petroleum Engineers, SPE 88610. 2004.

OSORIO, J.G. **seminario: Aspectos Geomecânicos de la Estabilidad de Pozos**. 2004.

OTTESEN, S. **Wellbore Stability in Fractured Rock**. Society of Petroleum Engineers, SPE 128728. 2010.

PASIC, B, MEDIMUREC, N.G., MATANOVIC, D. **Wellbore Instability: Causes and Consequences**. University of Zagreb, Faculty of mining, Geology and Petroleum Engineering. Croatia, 2007.

RALTMAN. **Rock Mechanics Self Learning Package**. Sugar Land Learning Center.

ROCHA, L.A.S., AZEVEDO, C.T. **Projetos de Poços de Petróleo- Geopressões e assentamento de Colunas de Revestimentos**. Editora Interciência, Rio de Janeiro, Brasil. 2007.

ROCHA, L.A.S., AZUAGA, D. RENATA, A., VIERA, J.L.B., SANTOS, O.L.A. **Perfuração Direcional**. Editora Interciência Ltda. P.18, 2011.

SANGONG, M., PARK, D., YOO, J., LEE JS. **Experimental and Numerical Analyses of an Opening in a Jointed Rock Mass Under Biaxial Compression**. ELSEVIER, International Journal of Rock Mechanics & Mining Sciences. 1055-1067. 2011.

SANTARELLI, F.J., DAHEN, D., BARONDI, H., SLIMAN, K.B. **Mechanisms of Borehole Instability in Heavily Fractured Rock Media**. Int. J. Rock Mech. Min Sci. & Geomech. Abstr., v 29, n 5,, pp 457-467; 1992.

SANTARELLI, F.J., DARDEAU, C., ZURDO, C. **Drilling through Highly Fractured Formations: a Problem, a Model, and a Cure**. 67 th annual technical conference and exhibition of the society of petroleum engineers. SPE 25592. 1992.

TAN, C.P., DETOURNAY, C., CHEN, X. **Factors Governing mud Infiltration and Impact on Wellbore Stability on Fractured Rock Masses.** 40 th U.S. symposium on rock mechanics (USRMS). ARMA/USRMS 05-834. 2005.

TALLAK, S., ROTHEBURG, L., DUSSEAULT, M., **Analysis of Borehole Stability using Discrete Element Models.** University of Waterloo, Ont., Canada. 1991.

TERZAGUI, K. **Theoretical soil mechanics.** New York, Wiley Publications, 1943.

TIMOSHENKO, S & GOODIER J.N. **Theory of elasticity.** Engineering Mechanics Stanford University, 1951.

WALES, S., RAHMAN, S. **Poroelastic Effects on Borehole Ballooning in Naturally Fractured Formations.** Society of Petroleum Engineers, SPE 79849. 2003.

WILLSON, S.M., LAST, N.C., ZOBACK, M.D., MOOS D. **Drilling in South America: A wellbore Stability Approach for Complex Geologic Conditions.** Society of Petroleum Engineers, SPE 53940. 1999.

WILLSON, S.M., EDWARDS, S.T., CROOK, A., BERE A. **Assuring Stability in Extended-Reach Wells- Analyses, Practices, and Mitigations.** Society of Petroleum Engineers, SPE 105405. 2007.

YAMAMOTO, K. SHIOYA, Y. **Discrete Element Approach for the Wellbore Instability of Laminated and Fissured Rocks.** Society of Petroleum Engineers, SPE 78181. 2002.

ZHANG, X., SANDERSON, D. **Numerical Modelling and Analysis of Fluid Flow and Deformation of Fractured Rock Masses.** Pergamon, 1999.

ZHANG, X., LAST N., POWRIE W., HARKNESS. **Numerical Modelling of Wellbore behaviour in Fractured Rock Masses.** ELSEVIER, Journal of Petroleum Science and Engineering. 95-115. 1999.

ZHANG, J., ROEGIERS, C. **Horizontal Borehole Stability in Naturally Fractured Reservoirs**. Society of Petroleum Engineers, SPE 65513. 2000.

ZHANG, J., ROEGIERS, J.C. **Borehole Stability in Naturally Fractured Reservoirs- A Fully Coupled Approach**. Society of Petroleum Engineers, SPE 77355. 2002.

ZOBACK, M. **Reservoir Geomechanics: Earth stress and rock mechanics applied to exploration, production and wellbore stability**. Department of geophysics, Stanford University, 2006.

Apêndice A

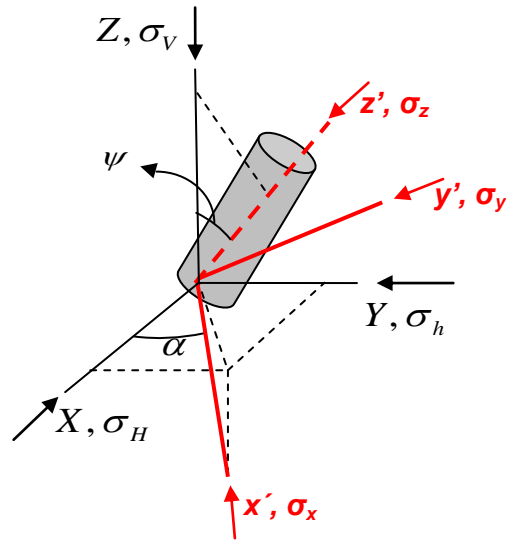


Figura A. 1 – Transformação de tensões num sistema coordenado.

$$\sigma_{x'} = (\sigma_H \cos^2 \alpha + \sigma_h \sin^2 \alpha) \cos^2 \psi + \sigma_v \sin^2 \psi \quad (\text{A.1})$$

$$\sigma_{y'} = \sigma_h \cos^2 \alpha + \sigma_H \sin^2 \alpha \quad (\text{A.2})$$

$$\sigma_{z'} = (\sigma_H \cos^2 \alpha + \sigma_h \sin^2 \alpha) \sin^2 \psi + \sigma_v \cos^2 \psi \quad (\text{A.3})$$

$$\tau_{x'y'} = 0.5(\sigma_h - \sigma_H) \sin(2\alpha) \cos \psi \quad (\text{A.4})$$

$$\tau_{y'z'} = 0.5(\sigma_h - \sigma_H) \sin(2\alpha) \sin \psi \quad (\text{A.5})$$

$$\tau_{z'x'} = 0.5(\sigma_h \cos^2 \alpha + \sigma_H \sin^2 \alpha - \sigma_v) \sin(2\psi) \quad (\text{A.6})$$

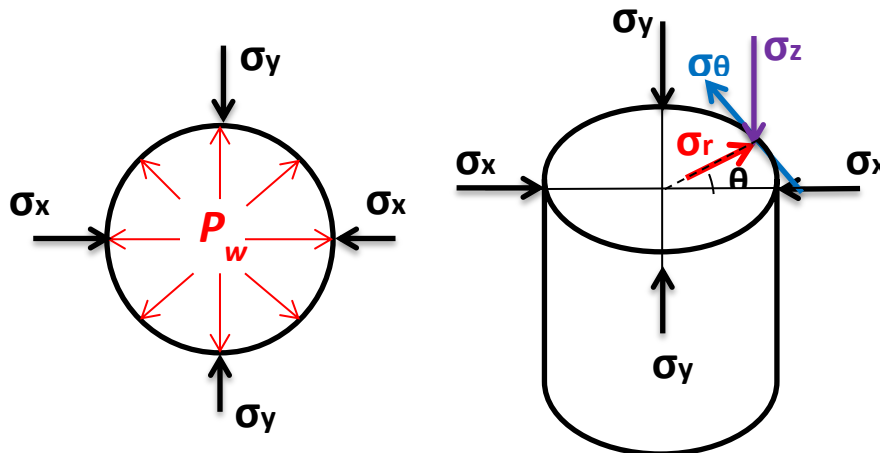


Figura A. 2 – Tensões em coordenadas cilíndricas atuando ao redor do poço.

$$\sigma_r = \left(\frac{\sigma_x + \sigma_y}{2} \right) \left(1 - \frac{R^2}{r^2} \right) + \left(\frac{\sigma_x - \sigma_y}{2} \right) \left(1 + 3 \frac{R^4}{r^4} - 4 \frac{R^2}{r^2} \right) \cos(2\theta) + \tau_{xy} \left(1 + 3 \frac{R^4}{r^4} - 4 \frac{R^2}{r^2} \right) \sin(2\theta) + P_w \frac{R^2}{r^2}$$

(A.7)

$$\sigma_\theta = \left(\frac{\sigma_{x'} + \sigma_{y'}}{2} \right) \left(1 + \frac{R^2}{r^2} \right) - \left(\frac{\sigma_{x'} - \sigma_{y'}}{2} \right) \left(1 + 3 \frac{R^4}{r^4} \right) \cos(2\theta) - \tau_{x'y'} \left(1 + 3 \frac{R^4}{r^4} \right) \sin(2\theta) - P_w \frac{R^2}{r^2}$$

(A.8)

$$\sigma_z = \sigma_z - \nu \left(2 \left(\sigma_{x'} - \sigma_{y'} \right) \frac{R^2}{r^2} \cos(2\theta) + 4 \tau_{x'y'} \frac{R^2}{r^2} \sin(2\theta) \right)$$

(A.9)

$$\tau_{r\theta} = \left(\frac{\sigma_{y'} - \sigma_{x'}}{2} \right) \left(1 - 3 \frac{R^4}{r^4} + 2 \frac{R^2}{r^2} \right) \sin(2\theta) + \tau_{x'y'} \left(1 - 3 \frac{R^4}{r^4} + 2 \frac{R^2}{r^2} \right) \cos(2\theta)$$

(A.10)

$$\tau_{\theta z} = \left(\tau_{y'z} \cos(\theta) - \tau_{x'z} \sin(\theta) \right) \left(1 + \frac{R^2}{r^2} \right)$$

(A.11)

$$\tau_{rz} = \left(\tau_{y'z} \sin(\theta) + \tau_{x'z} \cos(\theta) \right) \left(1 - \frac{R^2}{r^2} \right)$$

(A.12)