



Qualifications

1984, BSc Civil Eng
University of Cape Town

1986, MSc Eng.
University of Cape Town

1991, PhD
University of Cape Town

Professional Status

Professional Engineer (ECSA)

Fellow of the Southern African Institute of
Mining and Metallurgy (SAIMM)

Member of the Society for Mining,
Metallurgy, and Exploration (SME)

Specialization

Analysis and modelling of a wide range of
slurry types

Analysis and design of high concentration
slurry systems

Hydraulic and process design of overland
and underground mine pipeline systems

Design, selection and specification of
pumping systems and related control and
instrumentation equipment

Paste and thickened tailings systems

Backfill systems

Development of novel equipment for the
process and mining industry

Training Courses

Technical Reviews

Dr Robert Cooke is the principal of Paterson & Cooke's Denver, Colorado practice. Robert founded Paterson & Cooke with Dr Angus Paterson in 1991.

Robert has been involved in slurry transportation since 1985 and has experience with slurry system projects around the world, including backfill, long distance pipelines, hydraulic hoisting, marine mining applications and paste, thickened and conventional tailings operations.

Robert is a Member of the Society for Mining, Metallurgy and Exploration and a Fellow of the Southern African Institute of Mining and Metallurgy. He has written numerous technical papers on the application of slurry transport and lectures at a number of courses presented by Paterson & Cooke and other institutions.

Notable Projects

Cerro Verde Expansion, Peru

Project Director responsible for feasibility engineering of 240,000 tpd tailings delivery system and cyclone station facility. The project is at the start of basic engineering.

Syncrude Centrifuge Cake Transport, Canada

Participated in a number of studies and field trials investigating centrifuge cake pumping systems. Developed shear conditioning techniques to reduce the cake rheology.

Suncor Tailings Delivery System, Canada

Project Director responsible for detailing review and analysis of coarse sand tailings delivery system.

Chuquicamata, Chile

Expert advisor for project to investigate future tailings disposal systems for the 180,000 t/d operation. The two year contract includes on site pilot plant investigations.

Joslyn North Mine Project, Canada

Member of specialist team convened by Thurber Engineering tasked with developing an Alternate Tailings Plan for the Joslyn North Mine project. The scope of work includes tailings and centrifuge cake pump and pipeline systems.

Syncrude Slurry System Reliability Improvement, Canada

Detailed review and analysis of Syncrude's North Mine and Aurora Mine hydrotransport and coarse tailings pump and pipeline systems with the objective of recommending design and operating practice improvements to maximize component operating life and system reliability.

Esperanza, Chile

Hydraulic design review and specification for a 100,000 t/d paste tailings disposal system. The project is in construction phase.

Idaho Cobalt, USA

Project Director responsible for test work, hydraulic design and engineering of an underground paste backfill delivery system.

www.PatersonCooke.com

Robert Cooke, Pr.Eng, PhD

Morenci, USA

Project Director responsible for test work, hydraulic design and feasibility engineering of an autoclave residue delivery system.

Efemçukuru, Turkey

Project Director responsible for test work, hydraulic design and engineering of an underground paste backfill delivery system.

Sierra Gorda, Chile

Project Director responsible for test work, hydraulic design and feasibility studies for 100,000 t/d tailings delivery system.

Pebble Project, Alaska

Project Director responsible for test work, hydraulic design and feasibility studies for 360,000 t/d tailings delivery and return water systems.

Porgera, Papua New Guinea

Project Director responsible for hydraulic design of an underground paste backfill delivery system.

Reko Diq, Pakistan

Expert review of well field water supply and delivery system to proposed new mine.

Malmbjerg Project, Greenland

Project Director responsible for design of cyclone station and tailings delivery system design.

Fort Hills Project, Canada

Expert review of Oil Sands hydrotransport and tailings pipeline systems.

Yanacocha Gold Mine, Peru

Project Director responsible for test work, hydraulic design and detailed engineering of a new high concentration tailings system.

Peace in Africa, Namibia

Project Director responsible for test work, process and hydraulic design, and detailed engineering of front end for De Beers sea diamond mining vessel.

Debswana, Botswana

Project Director responsible for a project to investigate the optimum integrated waste disposal strategy for Debswana mines with a view to minimising water consumption.

Rustenburg Base Metal Refinery, South Africa

Project Director responsible for an on-site pipe loop investigation to determine the flow behaviour of slurries in the magnetic concentration and leaching sections. The information forms the basis of slurry pipeline system design software package developed by PCCE for Anglo Platinum.

Las Cenizas Backfill System, Chile

Preliminary design of an underground tailings disposal system for Las Cenizas Mine.

Cuiaba Mine Backfill and Tailings, Brazil

Project Director responsible for the Cuiaba Mine expansion feasibility study covering the following aspects: backfill preparation plant, tailings thickening facility, underground backfill distribution system, overland thickened tailings pumping systems and return water pumping systems.

Lisheen Paste System, Ireland

Project Director responsible for PCCE's role in the project which included pipe loop test data review and analysis, hydraulic design, transient assessment, pipe stress analysis and mechanical design of the piping and support system.

Anglo Platinum, South Africa

Project Director leading a development project aimed at implementing hydraulic hoisting technology in platinum mines.



CAPE TOWN • JOHANNESBURG • SANTIAGO • DENVER • SUDBURY

www.PatersonCooke.com

Robert Cooke, Pr.Eng, PhD

De Beers Marine, Namibia

Project Director responsible for the process design, hydraulic design and control philosophy of a jet pump based feed system for inline pressure jigs for the De Beers Marine mining vessels.

Orapa Mine Slurry Pumping System, Botswana

Project Director responsible for the upgrade of the Orapa slurry pumping systems. The working included on site rheology measurements, process and hydraulic design, mechanical design and commissioning.

Jwaneng Recrusher Plant Co-Thickening, Debswana, Botswana

Project Director responsible for the generation of a Class III cost estimate for the upgrade of the Recrusher Plant Co-Thickening Process. The work included hydraulic design, costing, detailing, risk assessment and construction and commissioning planning.

Cuiaba Concentrate Pipeline, Brazil

Project Director responsible for a 16 km concentrate pipeline feasibility study. The work included rheology and material property tests, pipeline route evaluation, process and hydraulic design and a detailed risk assessment.

Boulby Mine Backfill System, United Kingdom

Project Director responsible for the implementation of a backfill system for Cleveland Potash's Boulby Mine. The work included on site loop tests, backfill plant design, underground backfill reticulation system design and commissioning.

Corridor Sands Thickened Tailings Pumping System, Moçambique

Responsible for the process and hydraulic design of the non-Newtonian thickened tailings slurry pumping system for the Corridor Sands project.

Ramu Nickel Laterite Pipeline, Papua New Guinea

Audit of a proposed design for a 140 km overland non-Newtonian slurry pipeline traversing mountainous terrain. Prepared a new design for the pump and pipeline system.

Namdeb Floating Treatment Plant Elutriator, Namibia

Responsible for hydraulic and process design of a new elutriator for Namdeb's Floating Treatment Plant. The elutriator which treats 2 500 t/hr of ore was successfully commissioned in November 1999.

Kristineberg Backfill System, Sweden

Responsible for the design of 135 t/hr classified tailings backfill system for Boliden's Kristineberg base metal mine.

Serina Kaolin Slurry Pipeline, South Africa

Project Manager responsible for the project. Specific responsibilities included hydraulic and engineering design of the non-Newtonian kaolin slurry and return water pumping system, process plant design and layout, tender documentation, adjudication, contract administration, commissioning and operator training.

Backfill Systems, Brazil

Responsible for the design of backfill distribution systems for Mineração Morro Velho's Raposos, Mina Vehla and Cuiaba gold mines. Supervised slurry test loop tests conducted at the Queiroz metallurgical plant to obtain design information for the Raposos backfill system.

Mina Grande Hydrohoist Project, Brazil

Responsible for a technical evaluation of a proposed hydraulic hoisting system for Mineração Morro Velho's Mina Grande gold mine.

Publications

Keevy, M and R. Cooke (2010) "Optimizing Deposition Concentration at Minera Yanacocha, Peru", Tailings and Mine Waste 2010, Vail, Colorado USA, October 2010.

Treinen, J.M., R. Cooke and C. Salinas (2010) "Energy Induced Rheology Reduction of Flocculated Slurries", 18th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 18, Brazil, September 2010.



CAPE TOWN • JOHANNESBURG • SANTIAGO • DENVER • SUDBURY

www.PatersonCooke.com

Robert Cooke, Pr.Eng, PhD

Treinen, J.M., R. Cooke and C. Salinas (2010) "Energy Induced Rheology Reduction of Flocculated Thickened Tailings – Pipeline System Design Methodology", Paste 2010, Australian Centre for Geomechanics, Toronto, Canada, May 2010.

Salinas, C., R. Martinson and R. Cooke (2009) "Shear and Rheology Reduction for Flocculated Thickened Tailings", Paste 2009, Australian Centre for Geomechanics, Viña del Mar, Chile, April 2009.

Cooke, R. (2008) "Design Considerations for Paste and Thickened Tailings Pipeline Systems", 1st International Oil Sands Tailings Conference, Edmonton, Alberta, Canada, December 2008.

Cooke, R. (2008) "Pipeline Design for Paste and Thickened Tailings Systems", Tailings and Mine Waste '08, Vail, Colorado USA, October 2008.

Keevy, M., B. Busani and R. Cooke (2008) "Thickened and Paste Tailings Pumping Systems for Orapa Mine", Paste 2008, Australian Centre for Geomechanics, Perth, Australia, May 2008.

Vietti, A.J, R. Cooke, K. Ntshabele, M. Cooks and B. Busani (2008) "Rheomax and Water Conservation at Orapa Mine", Paste 2008, Australian Centre for Geomechanics, Perth, Australia, May 2008.

Goosen, P.E. and R Cooke (2007) "Hydraulic Scale-Model Tests for Slurry Handling Equipment", Hydrotransport 17, SAIMM/BHR, Cape Town, May 2007.

Cooke, R (2007) "Backfill Pipeline Distribution Systems – Design Methodology Review", MINEFILL2007, Montreal, Quebec, Canada, April 29 – May 3, 2007.

Keen, M., M Fehrsen, and R Cooke (2007) "Boulby Mine Backfill System: Operational Experience", MINEFILL2007, held in Montreal, Quebec, April 29 – May 3, 2007.

Cooke, R. (2007) "Thickened and Paste Tailings Pipeline Systems: Design Procedure – Part 2", Paste 2007, Australian Centre for Geomechanics, Perth, Australia, April 2007.

Cooke, R. (2006) "Thickened and Paste Tailings Pipeline Systems: Design Procedure – Part 1", Paste 2006, Australian Centre for Geomechanics, Limerick, Ireland, April 2006.

Busani, B., A.M. Copeland, R. Cooke and M. Keevy (2006) "A Holistic Approach to Optimise Process Water Retention and Residue Disposal for Orapa Mines", Paste 2006, Australian Centre for Geomechanics, Limerick, Ireland, April 2006.

Cooke, R. (2005) "High Concentration Tailings Transportation System Optimisation", Paste 2005, Australian Centre for Geomechanics, Santiago, Chile, April 2005.

Martinson, R., Cooke, R., Stipo, N., (2005) "Cabildo Mine Backfill System", Paste 2005, Australian Centre for Geomechanics, Santiago, Chile, April 2005.

Van den Berg, G. and R. Cooke (2005) "Hydraulic Hoisting Technology for Platinum Mines", Platinum Adding Value Conference, SAIMM, Sun City, October 2004, also published in Journal of South African Ins. Mining and Met., vol 105, No 5, pp 323 – 332, 2005.

Wilkins, M.J., C. Gilchrist, M. Fehrsen and R. Cooke (2004) "Boulby Mine Backfill System: Design, Commissioning and Operation", 16th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 16, Chile, April 2004, also presented at Minefill 2004, Beijing, China, September 2004.

Cooke, R., McDougall, S. (2003) "Elutriation – A Novel Way of Solving a Screening Problem", 4th One day seminar on hydraulic transport in the mining industry, Johannesburg, South Africa, April 2003.

Cooke, R. (2002) "Laminar Flow Settling: The Potential for Unexpected Problems", 15th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 15, Canada, June 2002.

Cooke, R. (2001) "Paste Reticulation Systems: Myths and Misconceptions", Minefill 2001, Society Mining, Metallurgy and Exploration Inc., 2001, pp 3-12.



CAPE TOWN • JOHANNESBURG • SANTIAGO • DENVER • SUDBURY

www.PatersonCooke.com

Robert Cooke, Pr.Eng, PhD

Cooke, R. (2001) "Design Procedure for Hydraulic Backfill Distribution Systems", Journal of the South African Institute of Mining and Metallurgy, vol. 101, 2001, no. 2, p. 97-102.

Cooke R., Johnson G., (1999) "Laboratory Apparatus for Evaluating Slurry Pipeline Wear", 14th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 14, Maastricht, The Netherlands, September 1999.

Cooke R, (1999) "Design Procedure for Hydraulic Backfill Distribution Systems", 101st Annual General Meeting of Canadian Institute of Mines, Calgary, May 1999.

Cooke R., Gericke D., Paterson A. J. C., (1998) "Design of Hydraulic Backfill Distribution Systems: Lessons from Case Studies", Minefill '98, the 6th International Conference on Mining with Backfill, 14 - 16 April 1998, Brisbane, Australia.

Cooke, R. (1996) "Selecting Appropriate Valves for Slurry Applications", S. A. Pump Man. Assoc. Annual Conf., 27-28 August 1996.

Cooke, R. (1996) "Design of Deep Mine Backfill Distribution Systems", 13th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 13, South Africa, 3-5 September 1996.

Cooke, R. (1996) "Pipeline Material Evaluation for the Mina Grande Hydrohoist System", 13th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 13, South Africa, 3-5 September 1996.

Cooke, R., Goosen, P. (1996) "Design and Construction of the Noordhoek Kaolin Slurry Pipeline", 13th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 13, South Africa, 3-5 September 1996.

Cooke, R (1995) "Pipeline Material Evaluation for the Mina Grande Hydrohoist System", 11th int. Conf. on Pipeline Protection, Italy, October 1995.

Cooke, R., Paterson, A.J.C., (1994) "Slurry Pipeline Transport Using Centrifugal and Positive Displacement Pumps", Developing & Implementing Effective Strategies to Enhance Pump & Valve Performance Reliability, S. A. Pump Man. Assoc., 23-24 February 1994

Cooke, R. (1994) "Horizontal Slurry Pipeline Design. Current Technology.", MineMech '94, South African Institute of Mechanical Engineers, 20-21 September 1994.

Cooke, R., Goosen, P., (1994) "Noordhoek Kaolin Slurry Pipeline", Proc. Slurry Transport in the Mining Industry (III), Hydraulic Conveying Association of S. A., 14 November 1994.

Goosen, P., Cooke, R. (1994) "Hydraulic Backfill Distribution System Design for Raposos Gold Mine", Proc. Slurry Transport in the Mining Industry (III), Hydraulic Conveying Association of S.A., 14 November 1994.

Cooke, R. (1994) "The Design of Hydraulic Backfill Distribution Systems for Deep Mines", IV Meeting of the Southern Hemisphere on Mineral Technology and III Latin-American Congress on Froth Flotation, 20-23 November 1994, Chile.

Cooke, R., Spearing, A.J.S. (1993) "The Influence of Binder Addition on the Hydraulic Transport Characteristics of Full Plant Gold Tailings Backfill", J. S. Afr. Inst. Min. Metall., Vol 93 No. 6, p 143-146.

Cooke, R., Lazarus, J.H. (1993) "Generalised Model for Heterogeneous Flow in a non-Newtonian Vehicle", 12th Int. Conf. on Slurry Handling and Pipeline Transport, Hydrotransport 12, Belgium, September 1993.

Cooke, R., Paterson, A.J.C. (1993) "Computer Aided Design of Slurry Pipelines", 12th Int. Conf. on Slurry Handling and Pipeline Transport, HYDROTRANSPORT 12, Belgium.

Cooke, R., Paterson, A.J.C. (1993) "The Design of Backfill Pipeline Distribution Systems using Computer Aided Techniques", Minefill '93, S. Afr. Inst. Min. Metall., September 1993.

Cooke, R. (1993) "Modelling the Flow of High Concentration Backfill Slurries", Minefill '93, S. Afr. Inst. Min. Metall., September 1993.



CAPE TOWN • JOHANNESBURG • SANTIAGO • DENVER • SUDBURY

www.PatersonCooke.com

Robert Cooke, Pr.Eng, PhD

Cooke, R., Lazarus, J.H. (1993) "Hydraulic Transport Systems for Deep Mine Backfilling", J.S. Afr. Inst. Min. Metall., Vol. 93, No. 2, p. 25-30.

Cooke, R., Paterson, A.J.C. (1993) "Control of Fluid Flow in a Piping System", South African Provisional Patent, 30 April 1993.

Cooke, R., Spearing, A.J.S., Gericke (1992) "The Influence of Binder Addition on the Hydraulic Transport Characteristics of Classified Tailings Backfill", J.S. Afr. Inst. Min. Metall., Vol. 92, No. 11/12, p. 325-329.

Goosen, P.E., Cooke, R., Lazarus, J.H. (1992) "Hydraulic Transport of Heavy Mineral Concentrates by Pipeline", Proc. 7th Int. Symp. on Freight Pipelines, Wollongong, Australia, July 1992, p. 109-113.

Cooke, R., Lazarus, J.H. (1992) "The Hydraulic Transport of Dense Phase Backfill Slurries", Proc. 7th Int. Symp. on Freight Pipelines, Wollongong, Australia, July 1992, p. 103-107.

Cooke, R., Steward, N.R. (1992) "Energy Dissipator", South African Patent.

Goosen, P.E., Cooke, R., Lazarus, J.H. (1991) "Hydraulic Transport of Heavy Mineral Concentrates by Pipeline", Proc. Slurry Transport in the Mining Industry (II) - Hydraulic Conveying Association of S.A.

Cooke, R., Lazarus, J.H. (1991) "Hydraulic Transport of Backfill - State of the Art", Proc. Slurry Transport in The Mining Industry (II) - Hydraulic Conveying Association of S.A.

Cooke, R., Lazarus, J.H. (1990) "Hydraulic Transport of Mixed Coarse Ash and Fly Ash by Pipeline", Proc. First National Symposium - South African Coal Ash Association, Paper 7, p. 7.1-19.

Cooke, R., Lazarus, J.H. (1988) "Isokinetic Sampling Probe for Slurry Flows", Proc. 11th International Conference on The Hydraulic Transport of Solids in Pipelines, Hydrotransport 11, Stratford, England, Paper C1, p. 117-130.



CAPE TOWN • JOHANNESBURG • SANTIAGO • DENVER • SUDBURY