

# CURRICULUM VITAE



## Markus A. Reuter

### Personal

- Born 29/4/1959 in Stellenbosch, South Africa from German parents.
- Married to Karen de Wet (1964), pianist, and have two children Tatjana & Jean-Michel.
- Dutch Citizenship (read, write and speak fluently German, Dutch, English, Afrikaans).
- Home address: 6/284 Williams Road, Toorak, 3142, Victoria Australia.
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- Email: [markus.reuter@outotec.com](mailto:markus.reuter@outotec.com) (work) / [markusa.reuter@gmail.com](mailto:markusa.reuter@gmail.com) (home) / Web: [www.outotec.com](http://www.outotec.com)
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### Education

- 2006: Doctorate in Engineering (D. Eng.) - Thesis Title: *"The Fundamental Limits of Recycling: From minerals processing theory to computer-aided design of automobiles and other consumer goods"*, 7<sup>th</sup> D. Eng awarded by the Faculty of Engineering, University of Stellenbosch in its 50+ year history.
- 1995: Dr. habilitation - Thesis title: *"Modellierung, Simulation und Synthese schwach-definierter Systeme in der extraktiven Metallurgie und Aufbereitung"*, Aachen University of Technology Germany (Friedrich Wilhelm Prize).
- 1991: Ph.D. - Thesis Title: *"Knowledge based simulation and diagnosis of metallurgical reactors"*, Extractive Metallurgy, University of Stellenbosch, South Africa.
- 1985: M. Eng. - Thesis Title: *"Optimisation of flotation plant networks"*, Material Process Engineering, University of Stellenbosch, South Africa.
- 1981: B. Eng. (*Honours, Cum Laude*) - Chemical/Material Process Engineering, University of Stellenbosch, South Africa.
- 1976: High School: Paul Roos Gymnasium Stellenbosch, South Africa, Matriculated with first class honours (*A-aggregate*).

### Professional Career

- **2006 (Dec) to present** – Outotec Ltd., Technical Director ([www.outotec.com](http://www.outotec.com)) formerly Ausmelt until June 2010.
- **2007 (Dec)** - Selected as one of the 100 Most Influential Melburnians (Category Environmental), Published by The Age Newspaper (Published by Fairfax Ltd., Sydney), December 14<sup>th</sup> 2007 Magazine ([www.theage.com.au](http://www.theage.com.au)).
- **2007** - Fellow of the Australian Institute of Engineers 2007 ([www.engineersaustralia.org.au](http://www.engineersaustralia.org.au)).
- **2006 (Dec) - Doctorate in Engineering** awarded by the University of Stellenbosch for work in the recycling field as well as sustainability ([www.sun.ac.za](http://www.sun.ac.za)).
- **2005 (July) to present - Professor of Sustainable Technology** (to 2006), University of Melbourne, Australia and now Professorial Fellow (since Dec 2006 after joining Outotec). I still regularly teach post and under-graduate courses at University of Melbourne ([www.unimelb.edu.au](http://www.unimelb.edu.au)) and have PhD students there.
- **2005 (July) to present - Professor Emeritus**, Delft University of Technology, The Netherlands ([www.tudelft.nl](http://www.tudelft.nl)).
- **1999 to 2007 - Extraordinary Professor** University of Stellenbosch, South Africa ([www.sun.ac.za](http://www.sun.ac.za)).

- **1997 to present** - Registered Chartered Engineer in South Africa, Membership number: 970176 Member Engineering Council of South Africa ([www.ecsa.co.za](http://www.ecsa.co.za)).
- **1996 to 2005** - **Professor of Metallurgy and Metallurgical Recycling**, Delft University of Technology ([www.tudelft.nl](http://www.tudelft.nl)), The Netherlands. (2002 My research group "Resource Engineering" rated "Excellent / 18 marks out of 20" by an international visitation commission organised by the Dutch Government Committee for Universities ([www.vsnul.nl](http://www.vsnul.nl)) . Only 10 % of the professors at the university have this rating.).
- **1995 (May)** - **Doctor Habilitation** awarded as well as Friedrich Wilhelm Prize for best Habilitation Thesis at the Aachen University of Technology, Germany ([www.rwth-aachen.de](http://www.rwth-aachen.de)).
- **1994 to 1996** - **Manager of the Furnace Control Group** (business unit developing and selling control systems for submerged-arc furnaces - 60 installations world-wide at the time), Mintek, South Africa ([www.mintek.co.za](http://www.mintek.co.za)).
- **1991 (Dec)** - **PhD** awarded: Knowledge based modelling of metallurgical processes ([www.sun.ac.za](http://www.sun.ac.za)).
- **1989 to 1994** - Research Metallurgist, Institute of Nonferrous Metallurgy, Aachen University of Technology, Germany ([www.rwth-aachen.de](http://www.rwth-aachen.de)).
- **1987 to 1989** - **Senior Lecturer**, Extractive Metallurgy, Stellenbosch University ([www.sun.ac.za](http://www.sun.ac.za)).
- **1985 to 1986** – **Research Scientist**, University of Free State ([www.uovs.ac.za](http://www.uovs.ac.za)) continuing the in-service training of black teachers, involved in writing educational software on the Apple 2e and first IBM pc's.
- **1985 (Dec)** **M Eng (Eng)** thesis: Optimisation of flotation networks by linear programming.
- **1984 to 1985** - **Anglo American Corporation** ([www.angloamerican.co.za](http://www.angloamerican.co.za)) Metallurgical Trainee in gold metallurgy and diamond recovery.
- **1982 to 1984** - Conscripted in the South African Defence force. In the two year period I engaged in-service training to black science teachers based at the University of Free State ([www.uovs.ac.za](http://www.uovs.ac.za)) without an army rank.
- **1977 to 1981** - As a student worked in the metallurgical industry each December holidays from 3 months for Anglo American Corporation ([www.angloamerican.co.za](http://www.angloamerican.co.za)) being a bursar of this company.

## Overview of work

### Industry

**Technical Director**, Outotec ([www.outotec.com](http://www.outotec.com)) (formerly Chief Executive Technologist of Ausmelt before being taken over by Outotec) is a world leading technology provider in minerals processing, extractive metallurgy, recycling and energy. I among others look after the R&D, take part in marketing, site/customer services, projects and project development as well as technical developments and university research (includes CFD, thermodynamic data measurement, and thermodynamic modelling).

I was a *Manager in the Measurement and Control Division, Mintek (1994-1996)*, in which I was involved in modelling, simulation and control of submerged arc furnaces. I was a process metallurgist at Anglo American Corporation (South Africa – 1984 to 1985) and I am a registered Professional (Chartered) Engineer (South Africa).

I am a Member of TMS (USA), GDMB (Germany), SAIMM (South Africa) as well as a Fellow of Institute Engineers Australia. I was one of 100 most influential Melburnians for 2007 as per The Age newspaper of 14th December 2007 special edition.

### Academic

1996-2005 *Professor at the Delft University of Technology (Netherlands)* as metallurgist and since July 2005 Professor at *University Melbourne (Australia)* and now Professorial Fellow. The 45-50 people strong research group in TU Delft "Resource Engineering" rated "Excellent with a rating of 18 marks out of 20" by an international visitation commission organised by the Dutch Government Committee for Universities. Only 10% of the professors at the university have this rating.

I have written 6 Encyclopaedia Chapters, over *370 refereed journal, refereed and un-refereed conference proceeding publications* and have written 1 book (with colleagues Profs Heiskanen and Boin and Drs van Schaik, Yang and Verhoef) *“The Metrics of Material and Metal Ecology”* 706p. published by Elsevier (Amsterdam) in 2005. I am subject editor and serve on the Editorial Boards of four academic journals (Waste & Biomass Valorization, Minerals Engineering, Process Safety and Environmental Protection – IChemE, Erzmetall) and have been Guest Editor of for example special journal issues e.g. CFD modelling and simulation of waste-to-energy and waste incineration processes in the journal *“Progress in Computational Fluid Dynamics”* as well as on sustainability in the journal *“Minerals Engineering”*.

I have supervised 22 PhD and 105 Master students.

I have taught undergraduate and graduate courses in process metallurgy, process modelling/simulation of industrial metallurgical facilities, recycling & design for recycling/sustainability, industrial ecology, process control, also as part of the European Minerals Engineering Course, which we initiated from Delft with Helsinki University of Technology, Aachen University of Technology and Imperial College.

### Professional Associations/Committees/Conference Organizer

- Member of Minerals, Metals and Materials Society - TMS (USA [www.tms.org](http://www.tms.org)), Gesellschaft Deutscher Metallhütten und Bergleute (Germany [www.gdmb.de](http://www.gdmb.de)), South African Institute of Mining and Metallurgy (South Africa [www.saimm.co.za](http://www.saimm.co.za)), Society of Industrial Ecology (USA [www.is4ie.org](http://www.is4ie.org)), Fellow of Institute Engineers Australia (Australia [www.engineersaustralia.org.au](http://www.engineersaustralia.org.au)) and Member Engineering Council of South Africa (South Africa [www.ecsa.co.za](http://www.ecsa.co.za)).
- Various other activities (briefly):
  - Sustainability through Resource Conservation and Recycling (SRCR '06/ '09 / '11 - Elsevier), Minerals Engineering International ([www.min-eng.com](http://www.min-eng.com)).
  - Scientific Committee of European Metal Conference (Since 2001-2011 – major biannual conference [www.gdmb.de](http://www.gdmb.de)).
  - Scientific Committee Copper 2007 (CIM [www.cim.org](http://www.cim.org)), 2010 (GDMB [www.gdmb.de](http://www.gdmb.de)) (Principal Global Copper Conference).
  - Minerals, Metals and Materials Society: Chairman of TMS Lead-Zinc committee 2001-2002 (USA) / Sustainability 2010-(USA)/ Scientific committee of REWAS 04 / Technical Committee of TMS Fall 2002 Extraction and Processing Division Meeting on Recycling and Waste Treatment in Mineral and Metal Processing (2002) / Sustainable Materials Processing and Production—TMS 2010 Materials and Society Symposium / Sustainability Committee (2010-). ([www.tms.org](http://www.tms.org)).
  - Member Technical Committee of International Federation of Automatic Control IFAC since 1996 (Helsinki, Tokyo, Shanghai) (MMM [www.ifac-control.org](http://www.ifac-control.org)).

### Keynote, Invited Lectures, Invited Book Chapters, Book Invitation

- 2 Chapters in **Measuring Sustainability**, (Eds.) Graedel, T. and E. van der Voet, Strüngmann Forum Report, Vol. 4, Cambridge, MA. MIT Press (2010).
- 1 Chapter in **Encyclopaedia of Ecology**, Elsevier (2008).
- 1 Chapter in an UNEP report on Metal Resource (2010 –in preparation).
- 1 Chapter in **Smithells Metals Reference Book**, 8<sup>th</sup> Edition, Heinemann, New York (2002).
- 2 Chapters in **Ullmann's Encyclopaedia of Industrial Chemistry**, Wiley, Weinheim, Germany (1992).
- **Guest Editor:** Minerals Engineering (Elsevier - 2007/2010/2011) and Progress in Computational Fluid Dynamics (2008).
- **Plenary/Keynote/Invited lectures**
  - Plenary: WasteEng2010, Chinese Academy of Science, Beijing, May 2010 ([www.wasteng10.org](http://www.wasteng10.org)).

- Keynote: International conference: Life Cycle Management LCM09, Cape Town, September 2009 (see [www.lcm2011.org](http://www.lcm2011.org)) (withdrew due to illness).
- Plenary: European Metallurgical Conference 2009, GDMB, Innsbruck, Austria ([www.gdmb.de](http://www.gdmb.de)).
- Two Keynote lectures at REWAS, TMS Fall meeting on recycling, waste processing etc. held in Cancun, Mexico, October 2008 ([www.tms.org](http://www.tms.org)).
- Invited: 6 day Workshop on Measuring Sustainability, 40 invitees among Nobel Laureate, Frankfurt, November 2008. Contributed 2 chapters to book of this meeting (<http://fias.uni-frankfurt.de/esforum>).
- Plenary: Open the Recycling of metal containing materials workshop, Colorado School of Mines, Golden Colorado, 22<sup>nd</sup> - 24<sup>th</sup> June 2008 ([http://outreach.mines.edu/cont\\_ed/heavy.shtml](http://outreach.mines.edu/cont_ed/heavy.shtml)).
- Presentation to the **Victorian Parliament** on e-Waste recycling during Victoria Summit (Melbourne, Australia - November 2007).
- Invited: Workshop on continuous converting, Copper 2007, Toronto and Zinc/Lead processing COM 2008, Winnipeg ([www.cim.org](http://www.cim.org)).
- Plenary: International Iron and Steel Institute Members Conference of the International Iron and Steel Institute (Buenos Aires - 2006) attended by CEOs from the Iron and Steel industry ([www.worldsteel.org](http://www.worldsteel.org)).
- Keynote: Sustainability in Metal Production, Melbourne, Australia, 2005 (Floyd Conference, Melbourne and various invited lectures on recycling in Australia).
- Plenary: Nordic Minerals Engineering Conference, Lulea, Sweden, 2005.
- Keynote: Molten Salts, Slags and Fluxes conference, Cape Town, South Africa, 2004 ([www.saimm.co.za](http://www.saimm.co.za)).
- Keynote: TMS Meeting, Recycling, 2004 ([www.tms.org](http://www.tms.org)).
- World council of waste processing 2004 WTER (Columbia University, New York) ([www.seas.columbia.edu/earth/wtert/](http://www.seas.columbia.edu/earth/wtert/)).
- Keynote: International Minerals Processing Congress (IMPC), Cape Town, South Africa, 2003 ([www.saimm.co.za](http://www.saimm.co.za)).
- Keynote: Yazawa Conference (TMS - San Diego) 2003 ([www.tms.org](http://www.tms.org)).
- Keynote: With colleague at International Federation of Automatic Control conference (Tokyo, Japan - 2001) ([www.ifac-control.org](http://www.ifac-control.org)).
- Invited: Workshop on Recycling during CIM - Canadian Institute of Metallurgy, Annual Meeting in Toronto (2001) ([www.cim.org](http://www.cim.org)).
- Plenary: Minerals Engineering Conference, Cape Town, South Africa, 1997 ([www.saimm.co.za](http://www.saimm.co.za)).
- **Session chairs** at numerous TMS meetings since 1996 (Zn, Al, waste processing, recycling etc.), “Minerals Engineering” conferences since 1996, IFAC conferences since 1999, European Metal Conference (2001-2010) – among others. ([www.tms.org](http://www.tms.org))
- **Invited lecturer/instructor** for the **International Zinc Association (IZA-Brussels)** for biannual Zinc Colleges for the Executives from the Zinc and related industries held in (i) Delft: Netherlands - 1997, (ii) Korea - 1999, (iii) Lima: Peru - 2001, (iv) Changsha: China - 2002, (v) Duisburg: Germany - 2004, (vi) Torreon: Mexico - 2006, and (vii) Townsville: Australia – 2008 ([www.iza.com](http://www.iza.com)).

## Summary of Publications (>370) and Theses

- **PhD students:** 22 (+2 in Melbourne jointly with other professors through Outotec projects).
- **MSc students:** 105.
- **1 Book:** **Metrics of Material and Metal Ecology**, Elsevier Science, Amsterdam (2005).
- **1 Patent** (held by Corus).

- 6 Chapters in Encyclopaedias / 19 Chapters in books, International Zinc Association (IZA) book, significant reports.
- **Over 142** Publications in refereed Journals such as (also review for these) work is not only cited in academic literature but also in [EU](#), [UNEP](#) and other significant reports.

**Environmental Engineering / Recycling** Technological Forecasting and Social Change, International Journal of Life Cycle Assessment, Journal of Industrial Ecology, Resources Conservation and Recycling, Waste Management, Recycling International, RECYCLING magazine, Journal of Environmental Science and Health, Journal of Cleaner Production among others.

**Material Process Engineering** Chemical Engineering Science, International Journal of Minerals Processing, Minerals Engineering, Thermochimica Acta, Metallurgical Transactions B, International Journal of Applied Engineering Education, International Journal of Progress in Computational Fluid Dynamics, Journal of Metals, Computers and Chemical Engineering, Hydrometallurgy, Powder Diffraction, PHOENICS Journal (Computational Fluid Dynamics), Control Engineering Practice, Powder Technology, Journal of Electronic Materials, Computers and Chemical Engineering, Granular Matter among others.

- **Over 199** Publications in International Conference Proceedings (refereed).
- **Numerous** smaller conference publications and **Numerous** Industrial reports for Companies in South Africa, Belgium, The Netherlands, France, Australia, Italy, India, Germany (also via Master and PhD Projects).
- **Numerous** reports to industry, mostly confidential.

### Editorial Board/Editing/PhD Examiner

- Serve on the Editorial Advisory Boards of four Journals “*Minerals Engineering*” (Elsevier - since 1995), “*Erzmetall*” (GDMB - since 1996), “*Process Safety and Environmental Protection – Institute of Chemical Engineering / IChemE*” (Since 2004) and “*Waste & Biomass Valorization*” (Springer - since 2009).
- In addition editing for journals such as Hydrometallurgy, Chemical Engineering Science, International Journal of Minerals Processing, Journal of Industrial Ecology, Journal of Cleaner Production, Journal of Resource Conservation and Recycling and various others.
- Referee for various conferences e.g. International Minerals Processing Congress, IFAC MMM conferences, GDMB (Goslar) conferences, TMS (USA) conferences, Molten Salts, Slags and Fluxes Conference.
- PhD examiner for theses at Aachen University of Technology (Germany), Lulea University of Technology (Sweden), Åbo Academi (Finland), Melbourne University (Australia), Surrey University (UK), examined numerous PhD theses at TU Delft for other professors.

### Summary of work as Professor at the Technical University Delft and University of Melbourne

**TU Delft:** As Professor at Technical University of Delft I led a group of ca. 35 researchers doing research on recycling, sustainable/environmental technology and extractive metallurgy with an annual budget of ca. **€1,500,000** with industry research funding ca. **€800 000 per annum**. The projects are listed in more detail further below while financial details are:

- Head an interfaculty research group “**Smart Product Systems**” combines product/industrial design, mechanical engineering, aeronautical engineering and recycling/metallurgy to achieve sustainable product design (10 PhD’s and postdocs in consortium). (**Budget I managed over 4 years ending 2003: €3,000,000 over 4 faculties**)
- **Major company projects that I have been instrumental in soliciting since 1998 (total contract in € also given and if government supports):** (i) Corus (GB/NL-Steel: €800,000), (ii) Remag (Germany-Mg: €300,000 (governmental funding)), (iii) Pasmenco (Australia-Zn: €240,000.- (governmental funding)), (iv) Norddeutsche Affinerie (Germany-Cu: €50,000), (v) Konzelmann (Germany-Al: €100,000), (vi) Thermphos (Netherlands-P: €300,000 (governmental funding)), (vii) Glencore (Italy/Swiss-Zn/Pb: €20,000), (viii) Umicore (Belgium-24 metals: €300,000 (governmental funding)), (ix) Ford (USA: €50,000), (x) Ruhr Zinc (Germany-Zn: €20,000), (xi) AVR (Netherlands-waste processor: €150,000), (xii) Auto Recycling Netherlands (Netherlands-car recycler: €200,000), (xiii) Kerr McGee (USA-Ti: €100,000), (xiv) Billiton (South Africa-Fe-alloys production: €10,000), (xv) Sudamin Duisburg (Germany-Zn/Pb recycler: €200,000), (xvi) Arcelor (France-steel recycling: €10,000), Philips (Netherlands: €20,000), (xvii) DEMAG

(Germany: €40,000), (xviii) BMW (Germany), (xix) Auto Recycling Netherlands (Netherlands – 100,000), (xx) Ford (USA), to name a few important ones.

- Participant in the EU 6<sup>th</sup> Framework **SuperlighCar** project €250,000 led by Volkswagen between 2004-2009 ([www.superlightcar.com](http://www.superlightcar.com)).
- **Dutch University contacts and University/Agency projects:** Aachen University of Technology, Helsinki University of Technology, Lulea University of Technology, Stellenbosch University, MIT, Berlin University (projects): (i) SENTER and EET (*Dutch Agencies 3x PhD ca. €450,000*), Interfaculty research supported by University funds (*3x PhD student ca. €450,000*).

**Melbourne:** In the short period at University of Melbourne I have been on teams and soliciting grants e.g. ARC Discovery (water quality – \$A150,000.-) ARC-Linkage (modelling minor element in an Outotec reactor recycling e-waste – \$A200,000 and hydroxamate oxide flotation – A\$500,000.-). I still presently teach at this University and have had three PhD students, of which two of recently graduate.

### Extramural activities

- Reading, art, architecture, classical and contemporary music, being in nature, philosophy, cooking.
- Sport: Hockey (played at national level), Tennis, Cycling.