

# **Résumé of Prof. Johan van Dyk**

PhD (Minerals Engineering)

Master of Science (Engineering)

Hons. B.Sc. (Chemistry)

B.Sc. (Chemistry)



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## Career Overview

Prof. Johan van Dyk is an internationally recognized expert on Carbon and Energy Management, Fossil Fuel, Coal Chemistry and a renowned Coal and Carbon Gasification specialist. Johan's professional career developed over almost two decades at Sasol Technology, where his in-depth knowledge and keen scientific know-how has rocketed him into the highest ranks as a technical group leader at Sasol Technology's Research and Development unit.

Starting from 1995 he held the chair as Chief Scientist over the Sasol Gasification R&D function and by the time of his departure at the end of 2013, Dr van Dyk managed the ultimate position of "Technical Lead for Sasol Gasification R&D Coal Science His leadership and keen insights help Sasol optimize its world class gasification systems as he develops the characterization parameters for successful gasification and simulation tools for efficient coal utilization. Johan has been the coal technical lead for several Sasol Coal-to-Liquid project evaluation studies and is the go-to guy for quick and technical to-the-point answers.

His technical background, scientific experience and international R&D track record support his current role from September 2013 as Technology Manager at Africary where he will push for the successful commercialization of the UCG mining process by ensuring a cost effective, energy efficient implementation and operation of the Theunissen UCG project. In addition to the current technical portfolio, support on waste-to-energy and commercial gasification projects is also given as private coal and gasification consultant.

In his illustrious international career Johan has worked extensively on all major developments relating to coal, biomass, energy, gasification and coal to liquid projects.

In 2016 Johan received the **International University of Pittsburgh Award for Innovation in Coal Utilization**, in recognition of his outstanding leadership and innovation in coal and gasification conversion.

Over the past 20 years he has been the "Co-Chair of Gasification" at the International Pittsburgh Coal Conference. Under his auspices, over 100 novel and innovative papers and presentations on all cutting edge coal and gasification technologies are introduced, discussed and dissected before annual audiences of thousands. His international collaboration partners through-out his career include:

- Reliance Industries, India (Technical support, training and plant optimization)
- Jindal Steel and Power India, Angul Gasification Plant, India (Technical support and plant optimization)
- TRU Group, Strategic Mindset Technology, Coal Gasification (Technical support)
- EERC North Dakota, UND and DOE/NETL USA,
- Corus (Tata Steel) The Netherlands,
- Freiberg University Germany,
- ECN The Netherlands,
- Brigham Young University USA,
- MTI and Warsaw University Poland,
- CSIRO Australia,

- GTT Technologies Germany,
- And various others.

Professional Affiliations:

- Extraordinary Professor Stellenbosch University
- Technical Advisory Member to the Minister of Energy and Department of Energy in South-Africa
- Associate Professor North West University Potchefstroom
- International Vice-Chair and Board Member for International Pittsburgh Coal Conference
- ISO and SABS Technical Advisory and Referee Member
- Advisory Board Member for Virthucon, Freiberg University Germany from 2009-2016.
- Member of the Coal Processing Society of SA.
- Director and member of the South African Underground Coal Gasification Association.
- Member and Treasurer of the South African Underground Coal Gasification Association
- Reviewer for ELSEVIER (FUEL, Fuel Processing, Energy and Fuels, etc.)
- Program Coordinator Pittsburgh Coal Conference Gasification
- Study leader at Stellenbosch University
- Study leader at North-West University

**1            PERSONAL INFORMATION**

Surname	<u>van Dyk</u>
Full name	Johannes Christoffel (Johan)
ID number	720720 5043 080
Date of birth	20 July 1972
Sex	Male
Marital status	Married (Mariké) (Jean-Pierre 15 years and Jean-Paul 9 years)
Driver's license	Code 01 Code 08
Nationality	South African
Home language	Afrikaans
Other languages	English
Fully bilingual	Yes
Military commitments	None
Criminal offences	None
Health	Excellent

**2            CONTACT INFORMATION**

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### **3 EDUCATIONAL QUALIFICATIONS**

#### ***Secondary Education***

Last school attended	Afrikaans Hoër Kroonstad 1986-1990
Highest standard passed	St. 10
Subjects passed	Afrikaans (HG), English (HG), Mathematics (HG), Science (HG), Biology (HG), Computer Science (HG), Accounting (HG)

#### ***Tertiary Education***

Degrees obtained:

- 1. B. Sc. (Chemistry/Computer Science) - 1994**  
Potchefstroom University for CHE
- 2. Hons. B. Sc. (Chemistry) - 1995**  
Potchefstroom University for CHE
- 3. M. Sc (Eng) - 1999**  
University of Witwatersrand (WITS), Johannesburg  
Supervisor – Prof. Dr. R Falcon  
Thesis – Thermal fragmentation of Coal Sources for Gasification SCI
- 4. PhD (Minerals Engineering) - 2006**  
Potchefstroom University for CHE  
Thesis – Manipulation of gasification coal in order to increase the ash fusion temperature of the coal to operate the gasifiers at higher temperatures, North-West University, Supervisor – Prof. FB Waanders.
- 5. Post-PhD (Minerals Engineering) - 2008**  
North-West University, Potchefstroom, South-Africa

**Appointment as Extraordinary Professor Stellenbosch University (2018)**

**Appointment as Associate Professor – North West University (2012)**

Additional subjects completed/passed in **Accounting and Management:**

Economics I  
Statistics I  
Accountancy I and II

Business Management I and II  
Business ethics II  
Auditing II  
Merchantile Law II  
Entrepreneurial Law II

#### **4      *SPORT AND CULTURE***

Road running (27 Comrades medals), >100 marathons and half-marathons completed.  
Church (NG Church 4-Ankers).

#### **5      *OTHER TRAINING, COURSES AND INFORMATION***

##### **5.1      *Courses***

FACTSAGE™ thermo-equilibrium modelling (advanced training in 2007 with GTT-Technologies Germany)  
IP Sensitization Training (2007)  
Fundamental Facilitation Skills (2002)  
Basic Chemical Engineering (2001)  
Finance for Non-Financial Managers (1999)  
Skills in Diversity & Equity (1999)  
R&D Project Leadership and Organizational Behavior (1998)  
Full Range Leadership Development (1998)  
Lateral Thinking (1998)  
Core Interactive Skills (1998)  
Transforming the young leader (1997)  
Hand tools Training (Safety and Use)(1997)  
Process Technology (1996)  
Report writing (1996)  
Sasol quality service-QES(1996)

##### **5.2      *Membership and University Collaboration***

- Advisory Member to the Minister of Energy in South-Africa.
- Board Member and International Vice-Chair for International Pittsburgh Coal Conference from 2008.
- Advisory Board Member for Virthucon, Freiberg University Germany from 2009.
- Member of the Coal Processing Society of SA.
- Member of the South African Underground Coal Gasification Association
- Reviewer for ELSEVIER (FUEL, Fuel Processing, Energy and Fuels, etc.)
- Students project co-study leader at Stellenbosch University
- Students project co-study leader at North-West University
- Project leader and collaboration with EERC (North Dakota, USA), KIT (Germany), Freiberg University (Germany), GTT (Germany), Corus Steel RD&D (Netherlands), SGS (India and USA), Ningxia Coal (China).
- ISO and SABS Technical Committee Member (South-African National Standards)

<b>SUMMARY</b>		
<b>Refereed papers</b>	<b>Presentations</b>	<b>Patents files</b>
International = 37 South-African = 4 Handbook contributions = 2	Plenary = 3 International = 52 South-African = 118 Posters = 7	8

**TOTAL PAPERS, PRESENTATIONS AND POSTERS = 110**

1. Van Dyk, JC, Collins, AC and Muehlen, P., IMPORTANCE OF MINERAL MATTER SIMULATION AND UNDERSTANDING IN GASIFIER TECHNOLOGY SELECTION, GTT Technologies Users Seminar, Aachen, Germany, 25-29 June 2018.
2. Van Dyk, JC and Brand JF, UCG APPLICATION OPPORTUNITIES FOR THE POLYGENERATION OF POWER AND FUELS, Syngas Technologies Conference, USA, October 2017.
3. Van Dyk, JC, Brand, Waanders, FB, IN-SITU CO<sub>2</sub> CAPTURE DURING AN UCG PROCESS BY SIMULATING POSSIBLE CO<sub>2</sub> ADSORPTION ON ROOF AND COAL MINERAL STRUCTURES, 34<sup>th</sup> International Pittsburgh Coal Conference, Pittsburgh USA, 5-8 September 2017.
4. Uwaoma, RC, Van Dyk, JC, Strydom, CA, Matjie, RH and Bunt, JR, THE EFFECT OF THE ROOF AND FLOOR GEOLOGICAL STRUCTURES ON THE MINERALOGICAL COMPOSITION OF ASH PRODUCED FROM COAL AT UCG OPERATING CONDITIONS, 34<sup>th</sup> International Pittsburgh Coal Conference, Pittsburgh USA, 5-8 September 2017
5. Van Dyk, JC, J Brand, FB Waanders, AC Collins, THERMO CHEMICAL SIMULATION OF A COAL GASIFICATION PROCESS (APPLYING WASTE CAPTURED CO<sub>2</sub> EITHER FROM COMBUSTION OR GASIFICATION), 19<sup>th</sup> GTT Workshop, Aachen, Germany, June 2017.
6. Van Dyk, J.C., Brand, J.F. and Waanders F.B., EFFICIENT IN-SITU CO<sub>2</sub> CAPTURE AND CONVERSION IN A UCG PROCESS, 8<sup>th</sup> International Conference on Clean Coal Technologies, 8-12 May 2017, Italy.
7. Van Dyk, J.C., SUITABILITY OF COAL FOR GASIFICATION, 1<sup>ST</sup> International Workshop on Coal Quality 2016, 9-10 November 2016, New Delhi, India.
8. Van Dyk, JC, Brand JF and C Hattingh, COAL GEOLOGY – A SCIENTIFIC BUILDING BLOCK FOR UNDERGROUND COAL GASIFICATION, 35<sup>th</sup> International Geological Congress, 27 August 2016, Cape Town, South Africa.
9. AC Collins, JC van Dyk, CA Strydom, JR Bunt, Comparison between FACTSAGE™ thermo-equilibrium simulation data on the effect of temperature on coal mineral transformations and XRD results from ash formed at the temperatures, 2016 Annual SAUCGA Workshop, Johannesburg South-Africa, 8 August 2016 (poster).
10. Van Dyk, JC, Brand, JF, van Wyk, AC, Waanders, FB and Kahts, C, CORROSION TESTING OF STEEL FOR PRODUCTION AND INJECTION WELL APPLICATIONS IN A UCG PROCESS, 33<sup>rd</sup> International Pittsburgh Coal Conference, Cape Town, 12 August 2016.

11. JF Brand, JC van Dyk, UCG – Unlocking Southern-Africa’s Coal Potential: Update on the Africary’s Theunissen Underground Coal Gasification (TUCG) Project in South-Africa, 33<sup>rd</sup> International Pittsburgh Coal Conference, Cape Town, 12 August 2016.
12. **International University of Pittsburgh Award for Innovation in Coal Utilization**, in recognition of his outstanding leadership and innovation in coal and gasification conversion. Presented at the 33<sup>rd</sup> International Pittsburgh Coal Conference, Cape Town, 12 August 2016.
13. Van Dyk, JC, Brand, JF, van Wyk, AC, Waanders, FB and Kahts, C, CORROSION TESTING OF STEEL FOR PRODUCTION AND INJECTION WELL APPLICATIONS IN A UCG PROCESS, 8<sup>th</sup> International Freiberg Gasification Conference on IGCC and XtL, 12-16 June 2016, Cologne, Germany (poster).
14. Van Dyk, JC, Brand, JF, Roberg, E, ENERGY AND CCS POTENTIAL IN SOUTH AFRICA – A REVIEW, 8<sup>th</sup> International Freiberg Gasification Conference on IGCC and XtL, 12-16 June 2016, Cologne, Germany.
15. Van Dyk, JC and Brand, JF, Underground COAL GASIFICATION: South Africa’s electricity-generating breakthrough, Mining Review Africa Edition 11/2015, <http://spintelligentpublishing.com/Digital/Mining-Review-Africa/issue11-2015/files/30.html>
16. [Update on the 50-MW<sub>e</sub> Theunissen Underground Coal Gasification Project](#), by Johan van Dyk, African Carbon Energy and *North-West University*, Johan F. Brand, *African Carbon Energy*, Christien Strydom and Frans Waanders, *North-West University*, CornerStone Spring 2015, The Official Journal of the World Coal Industry, Volume 3, Issue 1, 2015.
17. JC van Dyk, J Brand, CA Strydom and FB Waanders, GROUNDWATER MONITORING DURING MINING OF COAL IN-SITU BY MEANS OF AN UNDERGROUND COAL GASIFICATION PROCESS, 14<sup>th</sup> Ground Water Division of the Geological Society of South Africa Conference and Exhibition to take place at Ekudeni, Muldersdrift, South Africa from 21 - 23 September 2015.
18. C. A. Strydom, T.Z. Sehume, J.R. Bunt and J.C. van Dyk, THE INFLUENCE OF SELECTED BIOMASS ADDITIONS ON THE CO-PYROLYSIS WITH AN INERTINITE-RICH MEDIUM RANK C GRADE SOUTH AFRICAN COAL, *The Journal of The Southern African Institute of Mining and Metallurgy*, VOLUME 115, AUGUST 2015 (707).
19. JF Brand and JC van Dyk, AFRICARY LEADING A NEW DAWN IN CLEAN COAL POWER FOR SOUTH-AFRICA, 2015 Annual SAUCGA Workshop, Secunda South-Africa, 24 August 2015.
20. JC van Dyk, J Brand, BB Beamish, RS Whitney and TP Levi, SPONTANEOUS COMBUSTION ASSESMENT OF A COAL RESERVE PLANNED FOR UNDERGROUND COAL GASIFICATION UTILIZATION, 7<sup>th</sup> International Freiberg Conference, Inner Mongolia China, 8-12 June 2015.
21. JC van Dyk, J Brand, CA Strydom and FB Waanders, GROUNDWATER MONITORING DURING MINING OF COAL IN-SITU BY MEANS OF AN UNDERGROUND COAL GASIFICATION PROCESS, IEA Workshop and Conference, Poland, April 2015.
22. Van Dyk, JC and Brand, JF, When and Why an UCG Project can be Successfully Implemented – A Fly-over of the 50 MWe Theunissen UCG

- Project in South-Africa, GASIFICATION INDIA 2015, 13-14 February 2015, New Delhi, India (presentation).
23. Van Dyk, JC, Brand, J. and Waanders, FB., Strydom, C., Update on the 50-MWe Theunissen Underground Coal Gasification Project, CORNERSTONE, The Official Journal of the World Coal Industry, Spring Issue 2015, 20 March 2015
  24. Van Dyk, JC, Suitability of Coal for fixed bed gasification, GASIFICATION INDIA 2015, 13-14 February 2015, New Delhi, India (presentation on behalf of Jindal Synfuels India).
  25. Marek Dudyński Johan C. van Dyk, Kamil Kwiatkowski, Marta Sosnowska, Biomass gasification: Influence of torrefaction on syngas production and tar formation, Fuel Processing Technology 131 (2015) 203–212.
  26. Van Dyk, JC, Brand, J., AFRICARY UNDERGROUND GASIFICATION PROJECT: An in-depth coal characterization study of the Theunissen Coal Reserve in South-Africa, 31<sup>st</sup> Annual International Pittsburgh Coal Conference, 6-9 October 2014.
  27. Van Dyk, JC, Brand, J., UCG – BRINGING A RESOURCE, TECHNOLOGY AND ECONOMICS TOGETHER FOR A 50MW POWER STATION IN SOUTH-AFRICA (plenary presentation), 31<sup>st</sup> Annual International Pittsburgh Coal Conference, 6-9 October 2014.
  28. Van Dyk, JC, Brand, J., GASIFICATION TECHNOLOGIES, SCIENCE AND SITE CHARACTERIZATION, UCGA Workshop at 31<sup>st</sup> Annual International Pittsburgh Coal Conference, 5 October 2014.
  29. Van Dyk, JC, Brand, J., DETERMINING THE COMMERCIAL VIABILITY OF UCG WITH FOCUS ON THE ENERGY CHALLENGES IN SOUTH-AFRICA, UCGA Workshop at 31<sup>st</sup> Annual International Pittsburgh Coal Conference, 5 October 2014.
  30. Van Dyk, JC, Brand, J. and Waanders, FB., EQUILIBRIUM COAL MINERAL MATTER SIMULATION AND SLAG FORMATION DURING AN UNDERGROUND COAL GASIFICATION PROCESS, 6<sup>th</sup> International Freiberg Conference, 19-22 May 2014, Germany.
  31. Van Dyk, JC and Keyser, M.J., INFLUENCE OF DISCARD MINERAL MATTER ON SLAG-LIQUID FORMATION AND ASH MELTING PROPERTIES OF COAL – A FACTSAGE™ SIMULATION, FUEL, Vol., 116, 15 January 2014, p. 834.
  32. Van Dyk, JC, INTERNATIONAL PLENARY PRESENTATION PITTSBURGH COAL CONFERENCE, 17 October 2012.
  33. Van Dyk, JC and Waanders, FB, VALIDATION OF PROPOSED MECHANISM TOWARDS IN-SITU CAPTURE DURING GASIFICATION BY SIMULATING A HIGH Si/Al AND LOW Ca CONTENT COAL SOURCE, 29<sup>th</sup> International Pittsburgh Coal Conference, USA, 17 October 2013.
  34. Aboyade, W, Knoetze, J, Gorgens, J and Van Dyk, JC, IMPACT OF CO-GASIFICATION AND AGRICULTURAL WASTES ON CONDENSATE PRODUCTION IN UPDRAFT GASIFIERS, 29<sup>th</sup> International Pittsburgh Coal Conference, USA, 17 October 2013.
  35. Van Dyk, J.C. and Keyser, M.J., INFLUENCE OF DISCARD MINERAL MATTER ON SLAG-LIQUID FORMATION AND ASH MELTING PROPERTIES OF COAL– A FACTSAGE™ SIMULATION STUDY, May



- 2012, Freiberg Gasification Conference, Leipzig, Germany (paper and presentation)(invited).
37. Van Dyk, JC and Coertzen, R., International Patent Classification, C10J 3/06 (2006.01), WO 2006/082543 A1, Method of operating a fixed bed dry bottom gasifier (increasing AFT)(patent filed in China).
  38. Van Dyk, J.C. and Keyser, M.J., INFLUENCE OF DISCARD MINERAL MATTER ON SLAG-LIQUID FORMATION AND ASH MELTING PROPERTIES OF COAL– A FACTSAGE™ SIMULATION STUDY, 14 September 2011, Pittsburgh International Coal Conference (paper and presentation).
  39. Van Dyk, J.C. and Keyser, M.J., Multiphase systems – a Factsage approach, 21 September 2011, Virthucon, Dresden, Germany (presentation)
  40. Van Dyk, J.C. and Keyser, M.J., INFLUENCE OF DISCARD MINERAL MATTER ON SLAG-LIQUID FORMATION AND ASH MELTING PROPERTIES OF COAL– A FACTSAGE™ SIMULATION STUDY, SACPS Conference, 16 August 2011, Secunda, South-Africa (presentation).
  41. Van Dyk, J.C., Aldrich, C., ONLINE ANALYSIS OF COAL ON A CONVEYOR BELT BY USE OF MACHINE VISION AND KERNEL METHODS, Production tracking number: GCOP 517486, International Journal of Coal Preparation and Utilization, Vol. 30, p. 331-348, June 2010.
  42. A. Luckos, M.N. Shaik, and J.C. van Dyk "Gasification and pyrolysis of coal", Handbook of Combustion, M. Lackner, F. Winter, A.K. Agarwal (Eds), vol. 4: Solid fuels, pp. 325-364, Wiley-VCH, Weinheim, 2010.
  43. Patent classifications: Manipulation of coal AFT and Coal preparation for gasification (2 gasification types) F965 - PCT Patent Application No. PCT/IB2009/052007  
F548 - United States Patent Application No. 11/814,721
  44. Van Dyk, J.C., EFFECT OF DENSE MEDIUM SEPARATION OF A SOUTH AFRICAN COAL SOURCE ON SLAG-LIQUID FORMATION: AN EXPERIMENTAL AND FACTSAGE APPROACH GTT Annual Workshop (paper and presentation), Pittsburgh International Coal Conference, September 2010.
  45. SUITABILITY OF A SOUTH-AFRICAN HIGH ASH CONTENT AND HIGH ASH FLOW TEMPERATURE COAL SOURCE FOR ENTRAINED FLOW GASIFICATION (poster), JC van Dyk and R Stemmer, Pittsburgh International Coal Conference, September 2010
  46. Van Dyk, J.C., EFFECT OF DENSE MEDIUM SEPARATION OF A SOUTH AFRICAN COAL SOURCE ON SLAG-LIQUID FORMATION: AN EXPERIMENTAL AND FACTSAGE APPROACH GTT Annual Workshop (presentation only), June 2010.
  47. Van Dyk, J.C., Aldrich, C., ONLINE ANALYSIS OF COAL ON A CONVEYOR BELT BY USE OF MACHINE VISION AND KERNEL METHODS, Pittsburgh International Coal Conference, September 2009.
  48. Van Dyk JC, Waanders FB, Keyser, MJ and Conradie, M, MANIPULATION OF THE ASH FLOW TEMPERATURE AND VISCOSITY OF A CARBONACEOUS SASOL WASTE STREAM, JFUE4414, Fuel, August 2009.

49. Van Dyk, Waanders and Hack, VISCOSITY PREDICTIONS OF THE SLAG COMPOSITION OF GASIFIED COAL, UTILIZING FACTSAGE EQUILIBRIUM MODELLING, JFUE-D-08-00259R1
50. Van Dyk, J.C. and Waanders, F.B., International Patent Classification, 26 June 2008, P42242ZP99, Gasification of coal (patent).
51. Van Dyk, J.C., Waanders, F.B. and Hack, K., MINERAL BEHAVIOUR OF CALCIUM-CONTAINING SPECIES IN THE MECHANISM TOWARDS IN-SITU CO<sub>2</sub> CAPTURE DURING GASIFICATION, FUEL, 13 March 2008, Vol., 87 (12) p. 2388-2393 (refereed paper).
52. Van Dyk, J.C., Waanders, F.B. and Van Heerden, J.H.P., QUANTIFICATION OF OXYGEN CAPTURE IN MINERAL STRUCTURE DURING GASIFICATION, FUEL, 13 Feb 2008, Vol. 87 (12), p. 2735-2744 (refereed paper).
53. Van Dyk, J.C. and Waanders, FB., *FactSage simulations, validated with HT-XRD analyses on mineral matter transformations during gasification*, IMPC08, 24-28 Sept. 2008, Beijing, China.
54. JC van Dyk / S Melzer / A Sobiecki, HTXRD and FactSage modelling to simulate mineral matter transformations during Sasol-Lurgi fixed bed dry bottom gasification – utilization of HT-XRD and FactSage modelling, Japan FactSage workshop, November 2007 (presentation).
55. JC van Dyk / S Melzer / A Sobiecki, Mineral matter transformations during Sasol-Lurgi fixed bed dry bottom gasification – utilization of HT-XRD and FactSage modelling, Virthucon Freiberg University, October 2007 (presentation).
56. Van Dyk, J.C. and Waanders, F.B., *Manipulation of gasification coal feed in order to increase the ash flow temperature of the coal enabling the gasifiers to operate at higher temperatures*, FUEL (86), p. 2728-2735, 2007 (refereed paper).
57. Van Dyk, J.C. and Waanders, F.W., *Quantification of oxygen capture in mineral structure during gasification*, SAIMM Conference, Cape Town, 1-3 August 2007 (presentation)
58. Van Dyk, J.C., *Coal properties important for coal conversion processes*, CoalPrep07, Lexington, Kentucky, USA, May 2007 (presentation).
59. Van Dyk, J.C., *Coal-to-liquids: The Sasol Experience*, ELECTRIC POWER Conference, May 2007, Chicago, USA (presentation at Coal-to-Liquids workshop).
60. Van Dyk, J.C. and Breytenbach, L., International Patent Classification, 4 January 2007, WO 2007/000724 A1, Particulate fuel for gasification purposes, (patent).
61. Van Dyk, JC, *Coal-to-liquids: The Sasol Experience*, CHEMCHON 2006, India, 2006, (invited plenary presentation).
62. Van Dyk, JC, *History of Sasol, The Sasol Experience and suitability of feedstocks for fixed bed gasification*, CSIRO Symposium, 1 Nov 2006, Newcastle, Australia (invited presentation).
63. 23<sup>rd</sup> International Annual Pittsburgh coal Conference, Pittsburgh, USA, September 2006, *Manipulation of gasification coal feed in order to increase the ash flow temperature of the coal enabling the gasifiers to operate at higher temperatures*, Van Dyk, JC (paper and presentation)

64. Van Dyk, JC and Coertzen, R., International Patent Classification, C10J 3/06 (2006.01), WO 2006/082543 A1, Method of operating a fixed bed dry bottom gasifier (increasing AFT)(patent).
65. JC van Dyk / S Melzer / A Sobiecki, Mineral matter transformations during Sasol-Lurgi fixed bed dry bottom gasification – utilization of HT-XRD and FactSage modelling, Minerals Engineering 19 (2006), 1126-1135 (refereed publication).
66. 7<sup>th</sup> European Gasification Conference, Barcelona Spain, April 2006, Workshop presentation, Syngas production – Sasol perspective (presentation)
67. 7<sup>th</sup> European Gasification Conference, Barcelona Spain, April 2006, Interpretation of mineral matter transformation during Sasol-Lurgi Fixed Bed Gasification by means of high temperature x-ray diffraction, JC van Dyk\* and S Melzer (poster)
68. Keyser, M.J., Conradie, M., Coertzen, M., and Van Dyk, J.C., EFFECT OF COAL PARTICLE SIZE DISTRIBUTION ON PACKED BED PRESSURE DROP AND GAS FLOW DISTRIBUTION, Fuel, JFUE3002 (refereed publication).
69. Reinecke, CF and Van Dyk, J.C., Coal Gasification: The experience of Sasol Technology, Energy and Coal of Russia, February 2006 (invited plenary presentation presented on behalf of Chris Reinecke)
70. Van Dyk, J.C., Understanding the influence of acidic components (Si, Al and Ti) on ash flow temperature of South African coal sources, Minerals Engineering, 19, 2006, p. 280-286 (refereed publication)
71. Van Dyk, J.C. and Keyser, M.J. and Coertzen, *Syngas production from South African coal sources using Sasol–Lurgi gasifiers*, International Journal of Coal Geology (Hydrogen from Coal), Vol. 65, Issue 3-4, 17 January 2006, p. 243-253 (refereed publication)
72. Co-operative Research Centre for Coal in Sustainable Development Symposium 2005, *Coal effects on syngas conditioning – An overview of the Sasol Process*, Van Dyk, J.C. and Keyser, M.J. and Coertzen, M., Brisbane, Australia, October 2005 (invited presentation JC van Dyk)
73. South African Coal Processing Society Conference 2005, *Suitability of feedstocks for the Sasol-Lurgi fixed bed gasification process*, Van Dyk, J.C. and Keyser, M.J. and Coertzen, M., Secunda, South Africa, September 2005 (presentation by MJ Keyser).
74. 22<sup>nd</sup> International Annual Pittsburgh coal Conference, Pittsburgh, USA, September 2005, *Mineral matter transformation during Sasol-Lurgi Fixed Bed Dry Bottom Gasification – utilization of HT-XRD and FactSage Modelling*, Van Dyk, Melzer and Sobiecki (paper and presentation)
75. 22<sup>nd</sup> International Annual Pittsburgh coal Conference, Pittsburgh, USA, September 2005, *Gasification of pellets – An environmental and renewable approach to fine coal and biomass*, Van Dyk and Coetzer (paper and presentation)
76. Mineral Processing 2005, SAIMM, Cape Town, Basic understanding of Sasol-Lurgi fixed bed dry bottom gasification and mineral matter transformations, JC van Dyk, 4 August 2005 (presentation)
77. Van Dyk, J.C., Baxter, L.L., van Heerden, J.H.P. and Coetzer, R.L.J., Chemical fractionation tests on South African coal sources to obtain

- species-specific information on ash fusion temperatures (AFT), Fuel, 84 (2005) pp. 1768-1777 (refereed publication)
78. PyroMet05 International Conference, Understanding the influence of acidic components (Si, Al and Ti) on ash flow temperature of South African coal sources, J.C. van Dyk, Cape Town, 14-15 March 2005 (presentation).
  79. Van Dyk, J.C. and Keyser, M.J., Characterization of inorganic material in Secunda coal and the effect of washing on coal properties, SAIMM, Journal of the South African Institute of Mining and Metallurgy, Volume 105, No. 1, January 2005, p. 1-6.
  80. 10<sup>th</sup> Coal Indaba 2004, South Africa, Interpretation of mineral matter transformation during Sasol-Lurgi Fixed Bed Gasification by means of high temperature x-ray diffraction, JC van Dyk\* and S Melzer (presentation)
  81. 2004 International Hi-Tech Symposium on Coal Chemical Industry & Coal Conversion, 30-31 October 2004, Shanghai, China, The application of Sasol-Lurgi Fixed Bed Dry Bottom Gasifiers in a Coal-to-Liquid facility, Van Dyk, J.C. (paper and presentation).
  82. 21<sup>st</sup> International Annual Pittsburgh coal Conference, Osaka, Japan, September 2004, Sasol's Unique Position in Synfuels Production, Van Dyk, Keyser and Coertzen (paper and presentation)
  83. 21<sup>st</sup> International Annual Pittsburgh coal Conference, Osaka, Japan, September 2004, Interpretation of mineral matter transformation during Sasol-Lurgi Fixed Bed Gasification by means of high temperature x-ray diffraction, JC van Dyk\* and S Melzer (poster)
  84. Sustainability of Coal Colloquium, SAIMM, 7-9 September 2004, The future of coal in Southern Africa, with specific focus on possible utilisation of the Waterberg coal reserves, Van Dyk, J.C.\* and Coertzen, M. (presentation)
  85. 5<sup>th</sup> European Conference on Coal Research and it's applications, University of Edinburgh, 6 – 8 September 2004, Syngas production via the Sasol-Lurgi Fixed Bed Dry Bottom Gasification Process (paper and presentation, presented by JR Bunt)
  86. Mineral Processing 2004, Interpretation of mineral matter transformation during Sasol-Lurgi Fixed Bed Gasification by means of high temperature x-ray diffraction, JC van Dyk\* and S Melzer (presentation)
  87. 20<sup>th</sup> International Pittsburgh Coal Conference 2003, USA, Co-gasification of biomass with coal in a Sasol-Lurgi Fixed Bed Dry Bottom Gasifier, JC van Dyk\*. (paper and presentation)
  88. 20<sup>th</sup> International Pittsburgh Coal Conference 2003, USA, Effect of coal particle size and dense medium beneficiation on yields, carbon and sulphur content of Secunda coal, JC van Dyk\*. (poster)
  89. Coal Ash Conference, South Africa, 2003, Govender, A\* and Van Dyk, JC, Mineral matter transformation during gasification. (presentation by A Govender)
  90. 18<sup>th</sup> Low-Rank Fuels Symposium, 2003, USA, Suitability of feedstocks for the Sasol-Lurgi Fixed Bed Dry Bottom Gasification Process, JC van Dyk\*/MJ Keyser/JW van Zyl. (paper and presentation)

91. 18<sup>th</sup> Low-Rank Fuels Symposium, 2003, USA, Characterisation of inorganic Material (discard) in Secunda coal and the effect of washing on coal properties, JC van Dyk\*/MJ Keyser. (paper and presentation)
92. Fuel, Vol. 82, Issue 18, 2003, pp. 2231-2237, Govender, A\*., Van Dyk, J.C. The effect of wet screening on particle size distribution and coal properties. (refereed paper)
93. Patent: "*Gasification of Carbonaceous Feedstock*" by M.J. Keyser, R.L. Coetzer and J.C. van Dyk, PCT patent number WO2005/090526.
94. 8<sup>th</sup> Coal Science and Technology Conference of the Fossil Fuel Foundation of Africa, South Africa, 15-17 October 2002, Suitability of feedstocks for the Sasol-Lurgi Fixed Bed Dry Bottom Gasification Process, JC van Dyk\*/MJ Keyser/JW van Zyl. (presentation)
95. 8<sup>th</sup> Coal Science and Technology Conference of the Fossil Fuel Foundation of Africa, South Africa, 15-17 October 2002, Full Scale Sasol/Lurgi Fixed Bed Test Gasifier Project: Impact of particle size distribution, destoning and gasifier operating conditions on sulphur production, MJ Keyser\*, JC van Dyk, RLC Coetzer, NJ Wagner. (presentation by M Keyser)
96. 8<sup>th</sup> Coal Science and Technology Conference of the Fossil Fuel Foundation of Africa, South Africa, 15-17 October 2002, Govender, A\*., Van Dyk, J.C, The effect of wet screening on particle size distribution and coal properties. (presentation by A Govender)
97. SAIMM Conference Cape Town, August 2002, Van Dyk, J\*, Keyser, M; Characterization of inorganic material in Secunda coal and the effect of washing on coal properties. (presentation)
98. Technical contribution in the IEA report, Matching gasifiers to coal, A-G Collette – 2002, van Dyk, JC\* and Keyser, MJ.
99. 19<sup>th</sup> International Pittsburgh Coal Conference 2002, Pittsburgh, USA, Interpretation of gasification operational data: Explaining the inter-relationship of coal and process parameters during stable gasifier operation and high gas production periods at Sasol Synfuels Secunda, JC van Dyk\*, RLJ Coetzer, MJ Keyser. (paper and presentation)
100. SA INSTITUTE OF MINING, METALLURGY AND MINERAL PROCESSING 2002, Cape Town, South Africa, Characterization of inorganic material in Secunda coal and the effect of washing on coal properties, JC van Dyk\*, MJ Keyser. (presentation)
101. Gasification Technologies Council, October 2002, San Francisco, USA, Suitability of feedstocks for the Sasol-Lurgi FBDB gasification process, JC van Dyk\*, MJ Keyser, JW van Zyl. (presentation by P van Nierop)
102. FUEL, Volume 80, Number 2, January 2001, p. 245, Development of alternative laboratory method to determine thermal fragmentation of coal sources during pyrolysis in the gasification process, JC van Dyk\*. (refereed paper)
103. 18<sup>th</sup> International Pittsburgh Coal Conference 2001, Newcastle, Australia, Full Scale Sasol/Lurgi Fixed Bed Test Gasifier Project: Impact of particle size distribution, destoning and gasifier operating conditions on sulphur production, MJ Keyser\*, JC van Dyk, RLC Coetzer, NJ Wagner. (paper and presentation by M Keyser)
104. Gasification Technologies Council, October 2001, San Francisco, USA, Continued value addition to coal through gasification technology, P van

- Nierop\*, HB Erasmus, JC van Dyk, JW van Zyl. (presentation by P van Nierop)
105. 6<sup>th</sup> Coal Science and Technology Conference of the Fossil Fuel Foundation of Africa, South Africa, 15-16 November 2000, *Full Scale Sasol/Lurgi Fixed Bed Test Gasifier Project: Effect of Destoning on Product Yields and Utility Consumption*, MJ Keyser, JC van Dyk\*/JW van Zyl. (presentation)
  106. 17<sup>th</sup> International Pittsburgh Coal Conference 2000, Pittsburgh, USA, Thermal fragmentation of South African coal and coal characteristics, JC van Dyk\*. (presentation)
  107. 17<sup>th</sup> INTERNATIONAL PITTSBURGH COAL CONFERENCE 2000, Pittsburgh, USA, *Full Scale Sasol/Lurgi Fixed Bed Test Gasifier Project: Experimental Design and Test Results*: Experimental Design and Test Results, MJ Keyser\*, JC van Dyk. (presentation, **award for best technical paper**).
  108. SAICHE 2000 National Meeting, A discrete simulation model for mixing coal sources in the bunkers at SCI in order to minimize variation in coal properties, JC van Dyk\*, M Meyer. (presentation)
  109. COAL INDABA '99, 5<sup>th</sup> Coal Science and Technology Conference, Johannesburg, South Africa, , Proposals for blending coal sources in such a way as to minimize thermal fragmentation within the gasifier, JC van Dyk\*, R Falcon. (presentation)
  110. Split-feed to gasification, Keyser, Van Dyk and Coetzer, 11 March 2004 (patent)
  111. Pelletising of fine coal with biomass, Van Dyk\*, Keyser, Breytenbach and Slaghuis, July 2004 (patent)

## **7            COMPUTER LITERACY**

*Chemsheet*  
*FactSage*  
*SimuSage*  
*Office – Word, Excel and PowerPoint*  
 Aspen Plus  
 Internet Explorer  
 Outlook, Pegasus  
 Statistica  
 @AGlance  
 Pascal, Cobol, C++ and other  
 Word Perfect  
 Lotus

## **8 EMPLOYMENT HISTORY**

**Current position**      **TECHNOLOGY MANAGER UCG  
AFRICAN CARBON ENERGY**  
**From**                      **1 Oct 2013 - date**

**PRIVATE CONSULTANT  
VAN DYK COAL CONSULTING (COAL, CHARACTERIZATION  
AND GASIFICATION) - (Pty) Ltd 2015/033141/07**

**Previous position**      **TECHNICAL SPECIALIST, TECHNICAL LEAD and GROUP  
MANAGER**  
**Coal and Gasification (level 4A)**  
**From**                      **May 2010 – Sept 2013**

**Coal Processing Technologies R&D, process optimization and simulation, Sasol  
Technology, R&D Division**

### **Main job functions**

**Technical specialist – Coal and Gasification Research**

- Student assistance at North West University and Stellenbosch University
- Technical lead to R&D projects in Coal and Gas Processing
- Gasification technology evaluation
- Pelletising of coal with biomass
- Biomass gasification and characterization
- Coal geological exploration / characterization for USA, China, India and Indonesia
- Optimization of syngas production
- Mineralogy study during gasification
- Optimization of gasifier performance
- CO<sub>2</sub> sequestration and utilization R&D
- IP support and patent evaluation
- Technical responsibility for gasification projects and long term project development
- Project co-ordination and logistics on coal sampling, analyses and data evaluation in Test Gasifier Project
- Responsible for data evaluation and interpretation of full scale tests
- Handling of Coal Characterization data evaluation and interpretation on Test Gasifier Project in Synfuels

**Previous position**                      **Chief Scientist (level 4b)**  
**Date**                                      **May 2005 - current**

**Previous position**                      **Principle Scientist Gr I (level 5a)**  
**Date**                                      **January 2002-May 2005**

**Previous position**                      **Principle Scientist (level 5b)**  
**Date**                                      **March 2000- January 2002**

**Previous Position**  
**Date**

**Senior Scientist (6)**  
**May 1999-March 2000**

Part of the team which support the drive and record gas production at SCI Sasolburg. Coal characterization and new coal source evaluation (1) and mixing of coal in the bunkers (2) were projects directly supported the goal.

Part of the test gasifier team from the 1998 with responsibility for all coal analyses and coordination thereof, data evaluation and part of the report writing.

Cross disciplinary task teams – CO<sub>2</sub>, Sasol-Lurgi IP team, CTL R&D team, Gasification operational platform, etc. During these group teams, communication is not only restricted to the formal sessions, but outside communication on a one-to-one basis are taking place on regular basis for technical discussions or idea discussions on specific topics.

**Position**  
**Date**

**Senior Scientist (6)**  
**January 1999-June 1999 (6 months rotational development)**

Main job functions

World Crude Oil figures – data evaluation  
Crude oil data research and analysis Scenario and Strategy Planning – LTFT and Olefin Project

**Position**  
**Date**

**Senior Scientist (6)**  
**January 1997-December 1998**

Main job functions

Responsible for the day-to-day plant support and optimization of Gasification SCI  
Selection of optimum coal sources for Gasification SCI  
Coal Gasification research  
Coal characterization  
Plant support for Gasification, Steam Stations and Sasol Coal Mines  
Project management for Gasification Plant Support  
Contact person between Sastech R&D and Gasification R&D  
Test Gasifier Project Secunda – Coal Characterization

**Position**  
**Date**

**Scientist Grade I (7)**  
**December 1995 – December 1996**

Main job functions

Coal Gasification research  
Coal characterization  
Plant support for Gasification, Steam Stations and Sasol Coal Mines

**Potchefstroom University for CHE**

Position **Student assistant and marking examiner**  
Date Chemistry (1993-1996)  
Computer Science (1992-1995)  
Mathematics (1995)



**9            *REFERENCES***

Will be supplied on request.