

CONCISE CURRICULUM VITAE OF LUCIAN W. BURGER

Lucian Burger is currently the Managing Director of Airshed Planning Professionals (Pty) Ltd and serves on the board of directors of Riscom (Pty) Ltd. Airshed Planning Professionals is a technical and scientific consultancy providing scientific, engineering and strategic air pollution impact assessment and management services and policy support to assist clients in addressing a wide variety of air pollution related risks and air quality management challenges. Riscom specialises in quantitative process risk assessments, including HAZAN, HAZOP, WHAT-IF analyses, detailed risk assessments, Major Hazard Installation (MHI) and incident investigations, and other risk related studies. Software design and development of air pollution dispersion models, dynamic process outflow and evaporation models, consequence models and database applications are maintained in Environmental Management Services.

He completed his bachelor's degree (cum laude) in chemical engineering at the University of Natal in 1982. His postgraduate studies (MSc Eng and PhD) were specifically focussed on the development of dispersion modelling theory and related software applications. These degrees were completed in 1984 and 1986, respectively.

Air pollution consultation consulting services started in 1990 with an international contract on the evaluation and validation of transport models as applied to the Chernobyl accident of April 1986 (International Atomic Energy Agency). Since then, numerous atmospheric dispersion studies have been completed locally and internationally, ranging from environmental impact assessments, risk and hazard assessments, meteorological studies, process designs, to the development of toxic gas evacuation response systems, and other related software.

1. QUALIFICATIONS

PhD (Chemical Engineering)	University of Natal	1986
MSc Eng (Chemical Engineering)	University of Natal	1984
BSc Eng (Chemical)	University of Natal	1982

2. CAREER HISTORY

Managing Director	Airshed Planning Professionals (Pty) Ltd	March 2003 onwards
Director	Riscom (Pty) Ltd	October 2003 onwards
Managing Member	Environmental Management Services CC	April 1990
Process Engineer	AECI Consulting Engineering Department	1989 to 1990
Senior Researcher	Council for Scientific and Industrial Research	1987 to 1988
Research Assistant	University of Natal, Department of Chemical Engineering	1983 to 1986

3. CONSULTANCIES

- **National Authorities**
 - Department of Environment Affairs and Tourism
 - Department of Water Affairs and Forestry
 - Department of Minerals and Energy
 - Department of Trade and Industry
 - Department of Labour
 - Foundation for Research Development
- **Community/Industry/Local Authorities**
 - Durban South Air Quality Management System – (installed the first system of the kind in South Africa - 1993)
 - Richards Bay Air Quality Management System
 - Coega Industrial Development Zone, Port Elizabeth
 - East London Industrial Development
 - Rustenburg Air Quality Forum.
 - Vaal Triangle Air Quality Management
- **Universities**
 - University of Natal
 - University of Witwatersrand
 - University of Joburg
 - University of Pretoria
 - University of the North
- **Industries** - On consultancy list for most major industries.

4. MEMBERSHIPS

- South African Institute of Chemical Engineers (*Fellow: No. 4533*)
- American Institute of Chemical Engineers (*Senior Member: No. 0090107071*)
- National Association of Clean Air (NACA)
- Accredited Inspectorate Authority (AIA) for completion of risk assessments as partial fulfilment of Major Hazard Installation Regulations (*Reference MHI013*)
- SANAS Risk Assessment Specialist Technical Committee (2003 - ongoing)
- Member of the Technical Committee on Air Quality Standards Setting (2002-2003)
- SABS Air Quality Standards Specialist Technical Committee (*Chairman of Working Group 1*)

5. EXPERIENCE

The main focus of his technical career has been to develop and share skills and mathematical methodologies used to describe the physical processes that result in exposure from contaminants in the atmosphere. These processes may be divided into three distinct groups, namely

- (a) the establishment of the emission source,
- (b) describing the behaviour of the atmosphere and the contaminant, and

- (c) assessing the degree of exposure to the contaminant (health risk, nuisance, property damage, ecological impacts).

His contribution to these processes varied from fundamental developments of mathematical theories to the adoption of widely published techniques into systems that allow practical assessment of exposures to air pollutants.

The most widely known development was perhaps the HAWK Real-Time Dispersion Model. The HAWK software is a mathematical tool that simulates the emission, transport and dilution of toxic chemical releases into the atmosphere, albeit routine or accidental. The theoretical developments in the software include simulation modules to describe both static and temporal behaviour of emission sources. These range from stack vents to spillage from pressurised vessels. The simulation of pressurised vessels includes foaming, flashing, droplet formation and the evaporation of the non-flashed fractions. Modules were also developed to simulate three-dimensional wind fields that operate in near real-time using multiple meteorological measurements (3-dimensional). The puff-based dispersion model have been optimised specifically to run in real-time conditions, allowing for spatially and temporally changing conditions over short durations. A unique contouring package was similarly developed to accommodate the display of concentration levels at very fine resolutions.

Similar tools have been developed to address other atmospheric releases, such as landfill gas generation, cooling tower plumes, water-reactive plumes (e.g. silane), sulphur storage fires and associated products and wind erosion from exposed surfaces (e.g. ADDAS Model).

The timeous development of these methodologies enabled many successful air pollution and risk assessments in an increasingly complex industry. Projects have been completed for the petrochemical and chemical industries, mining operations, metal recovery (pyrometallurgy and hydrometallurgy), cement industry, pulp and paper, power generation (conventional and nuclear), landfill and wastewater treatment facilities, incineration operations, manufacturing of herbicides and pesticides, airports, vehicle impacts (e.g. roadways, city centres, filling stations), etc.

Due to his active involvement in the field of air pollution and quantified risk assessments, he has also been invited to serve on cooperative projects and steering committees for strategic decision support and the development of standards and methodologies. Examples of decision support include the

Formulation of Regulative Strategies [e.g. landfill buffer designs, thermal treatment of sewerage, low-smoke fuel strategies planning, vehicle fuel specifications, application of dispersion models and parameters in the nuclear industry]

Provision of Expert Testimony [e.g. Herbicide Contention Case: Victory Farm v HL&H Timber Products (Pty) Ltd, Rautenbach Aerial Spraying Ltd, Alan James McEwan; SAPREF Alkylolation Unit Fire, Rhone-Poulenc Warehouse fire, Shell-Sasol Alcohol Reformulation Contention; Kudu Oils v Department of Environmental Affairs and Tourism), Global Forest Products (Pty) Ltd & Others v Lone Creak River Lodge (Pty) Ltd & Others; Pride Milling Company (Pty) Ltd v Klipspruit Colliery & Others; Triple S Diensstasie Edms Bpk / P Senekal; PetroSA v Langeberg Shopping Mall, PetroSA v Visigro Investments]

Numerous air quality modelling analyses for **Environmental Impact Assessments**.

Mining and Ore Handling

*Blasting; quarrying;
grinding; crushing;
conveying; vehicles;
tailings dams; etc*

BHP-Billiton Bauxite Mine (Suriname), Exxaro Heavy Minerals Mine and Processing (Madagascar), Tenke Copper Mine and Processing Plant (DRC), Sari Gunay Gold Mine (Iran), Zaldivar Copper Mine (Chile); Gold Mine at Omagh (Ireland); ZCCM Luancha Copper mine (Zambia); Skorpion Zinc mine (Namibia); Rossing Uranium (Namibia); Trekkopje Uranium (Namibia); Gokwe Coal Mine (Zimbabwe); Murowa Diamond Mine (Zimbabwe); Gamsberg Zinc Mine (Aggeneyns); Prieska Copper mine (Prieska); Numerous coal collieries (Anglo Coal, Exxaro, Xtrata); Lime Quarries (La Farge, formerly Blue Circle, East London and Otjiwarongo, Namibia); Clinker Grinding and Cement Blending Plant (La Farge, Richards Bay); Bluff Mechanical Appliances – Durban Coal Terminal; Portnet's Saldanha Ore Port Facility; and others.

Metal Recovery

smelting; electro-winning

Samancor/Kermas Air Quality Baseline for all South African Chromium Smelter and Mines (Ferroveld, Ferrometals, MFC, Columbus, Tubatsi, Western Chrome Mines, Eastern Chrome Mines), Hexavalent Chromium Air Quality Reference Document (FAPA), Hartley Platinum Smelter (Zimbabwe); Mufulira Smelter (Zambia), Nkana Smelter (Kitwe, Zambia); Waterval Smelter (Amplats, Rustenburg); Lonrho Smelter (Brits); Ergo (Anglo American Corporation, Springs); Coega Zinc Refinery (Billiton, Port Elizabeth); Hexavalent Chrome and Lead (Winterveld Chrome Mines); Hexavalent Chrome Xstrata (Rustenburg); Pitch releases from graphite electrode (EMSA, Union Carbide, Meyerton); Copper Smelting (Palabora Mining Company, Phalaborwa); Portland Cement Plant (La Farge, East London and Otjiwarongo, Namibia); Westplats – Mooinooi Smelter (Brits), Holcim Alternative Fuels Project (Lichtenburg, Ulco and Blending Plant – Roodepoort), PPC Riebeeck West Expansion Project

Chemical Industry

*bulk chemical; fertilizer;
herbicides; pesticides*

Various Pollutants from AECI (Pty) Ltd Operations, including Modderfontein, Umbogintwini, Somerset West, New Germany and Richards Bay; Kynoch Fertilizer plants in Milneron and Potchefstroom; Fedmis Fertilizer Plant in Phalaborwa; Pesticides and Herbicides at Sanachem (Canelands); Chrome Impacts from various Bayer (Pty) Ltd operations (Newcastle and Durban); Fibre Production (Sasol Fibres, Durban); NCP Chloorkop Expansion project, NCP Chloorkop Contaminated Soils Recovery

Petrochemical Industry

Petroleum refineries, tank farms

Baseline and Expansion of Liquid Natural Gas Refinery (Equatorial Guinea); Site Selection for New South African Petroleum Refinery (DME), Proposed new Greenfields Petroleum Refinery at Coega (PetroSA), Hydrogen sulphide and sulphur dioxide emissions from SASOL operations (Sasolburg and Secunda); Saslo Coal to Gas Conversion Project (Sasolburg), Natref Refinery Expansion Project

(Sasolburg); Engen Emissions Inventory Functional Specification (Durban); Air impact of air emissions from Sapref Refinery (Durban) Odour Impact assessment at ChevronTexaco Refinery (Cape Town); PetroSA (Mossel Bay), Air impact of air emissions from Killarney, Milnerton and Saldanha Bay bulk storage tanks, Ambient air sampling campaign and Health Risk Analysis at Major Highway, Toll Plazas, Filing Stations and Taxi Ranks (Sasol)

Power Generation

stack emissions; coal and ash dump

Kelvin Power Station (Johannesburg); Athlone Power Station (Cape Town); Tatuka, Kendal, Matimba, Duvha and Majuba Power Stations, ESKOM; Open Cycle Gas Turbine Peaking Power Station (Mosselbay), Enhamabane Power Station, Mozambique.

Waste Disposal

Incineration; landfill; evaporation; waste water treatment

All Enviroserv disposal sites (Chloorkop, Margolis, Umlazi, Vissershok, Shongweni, Aloes, Holfontein, Rosslyn), Cape Town City Council, Durban City Council, Johannesburg City Council; East London City Council; Port Elizabeth City Council; etc

A number of unusual projects have also been completed, for example calculating the emissions of rocket motor exhaust gases for proposed satellite launching programme, and determining local and global (ozone layer) impacts. Pollutants included hydrogen chloride, aluminium oxide, nitrous oxides, etc.

Quantitative Acute Health Risk Assessments and Consequence Modelling: Air Products Durban plant (Hydrogen); Full assessment (chlorine, ammonia, acrylonitrile, sulphur dioxide) AECL, Umbogintwini Factory Complex; Oleum Storage Tank Farm - Lever Brothers. Boksburg; Ammonia Tank Farm - Palabora Mining Company, Palaborwa; Ammonia Refrigeration Unit, Palabora Mining Company, Palaborwa; Chlorine Dosing facility - Palabora Mining Company, Palaborwa; Accidental liquid Bromine spills and fugitive gas emissions at Delta-G Scientific, Halfway House; Accidental emissions and spills of organo-pesticides at Sanachem, Verulam. Burning of waste dumps in Botswana (Botswana Government). Chlorine Dosing Facility at mining operations (Rustenburg); Dispersion and Consequence Modelling of Toxic Liquid Spills (e.g. Acrylonitrile and Propylene Oxide), Combustion Products (e.g. Hydrogen Cyanide), Bund Fires and Vapour Cloud Explosions of a large number of storage tanks at Vopak (formerly Van Ommeren) Tank Terminals, Durban Harbour, Fire at Sapref Refinery Alkylolation Unit; Risk assessment of ammonia, hydrogen fluoride and nitric acid Columbus Stainless (Middelburg); Natural Gas Pipeline from Mozambique to Secunda (Sasol Gas).

Various developments of dispersion modelling software programs include:

Development of real-time atmospheric dispersion model - *HAWK*: Atomic Energy Corporation of South Africa; CALTEX, Cape Town; NCP CHLOORKOP, Kempton Park; MOSSGAS, Mosselbay; PALABORA MINING COMPANY, Palaborwa; AECL, Umbogintwini; AECL, Modderfontein; SASOL, Secunda; SASOL, Sasolburg; SAPREF Refinery, Durban; ENGEN Refinery, Durban; ESKOM, Majuba Power Station; South Durban Air quality

management system (Joint venture between major industries, authorities and community); SAPPI-SAICCOR, Umkomaas; HARTLEY PLATINUM, Zimbabwe, Richards Bay Air Quality Committee (Joint venture between major industries, authorities and community), ISCOR, Newcastle; ISCOR, Vanderbijlpark.

Related software packages: Simulation of cooling tower plumes (AECI and SASOL). Convective boundary layer model for ESKOM. Fugitive ash emission model (*ADDAS*) for ESKOM. Landfill emissions model for Waste-Tech. Low-smoke coal impact screening model for Department of Mineral and Energy Affairs. Statistical and data management of air pollution parameters for ESKOM (*HIPPO*). Meteorological parameter estimator (*OWL*) for Zambian Consolidated Copper Mines (Zambia). Wind erosion and meteorological parameter estimator (*OWLx*) for Driefontein Mine.

Statistical analyses of air pollution and meteorology monitoring networks (e.g. Vaal Triangle Air Quality Project, Design Specifications for Nuclear Power Plant).

A handwritten signature in black ink, appearing to read 'Suzanne', written in a cursive style.

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