

Hannes Pretorius

PhD, Pr Eng

Solar | Thermal | Thermo-Fluids | Project Engineering | Lecturer



Contact details

079 875 4286

jpp@sun.ac.za

Executive summary

• Masters and PhD with focus on large-scale solar power production • 8 years' experience in power generation industry in engineering role • Technical Lead for the Cooling and Condensing Division • Most notable project engineering roles on Medupi & Kusile power stations – direct engineering responsibility on multi-billion Rand plant • Highly skilled in technical design reviews & attention to detail • 4 years' experience in Aerospace industry • Chief engineer on aero gas turbine development project • Systems Engineer and Project Manager on micro aero gas turbine development project • Currently Senior Lecturer at Stellenbosch University

Profile

Driven engineer with a background in power generation, solar energy & aerospace engineering. Self-motivated person with a strong work ethic, striving for excellence in all tasks undertaken. Valuable attributes include real leadership, excellent communication capabilities and a good sense of humour. Person of strong moral fibre, with belief in the importance of interpersonal relationships and in conducting business with integrity.

Summary of key skills

Technical & managerial leadership • Project engineering & management • Specialization experience in Solar, Cooling & Gas Turbine Engineering • Technical specifications • Co-ordination & performing of technical design reviews • Problem analysis & solving • Technical tender evaluation • Project document management • Modelling of thermo-fluid systems • Advanced MS Excel skills • Research & Development

Career history

2016-present	Head of Thermo-Fluids Division ΔV Aerospace
2015-2016	Senior Thermo-Fluids Engineer ΔV Aerospace
2012-2015	Chief Engineer Eskom
2010-2011	Senior Engineer Eskom
2009-2010	Senior Advisor Engineering Eskom
2008-2009	Engineer Eskom
2007-2008	Assistant Engineer Eskom

E-mail: jpp@sun.ac.za

Mobile: 079 875 4286

Project experience

Mistral | Prototype aero gas turbine development project | 1 kN class
| Roles: System Engineer, Overall engine thermodynamic designer

Development project running over 2+ years for the design, fabrication, assembly, ground testing and flight testing of a full-spec prototype aero gas turbine engine.

- Accountable for requirements definition, solution definition, product realization and technical management of requirements, planning, control, assessments, decisions and interfaces of the project
- Responsible for overall thermodynamic gas turbine design
- Accountable to ensure technical integrity of thermo-fluid design of all applicable engine subcomponents
- Human capital development with client in terms of system engineering process and technical design reviews

Crawler | Prototype aero gas turbine development project | 3-6 kN class
| Roles: Chief Engineer, Core Engine System Engineer, Compressor Aerodynamic designer

Development project running over 3+ years for the design, fabrication, assembly and test of two full-spec prototype aero gas turbine engines.

- Responsible for overall thermodynamic gas turbine design
- Responsible for detail aerodynamic design of transonic multi-stage axial compressor using 1D to CFD tools
- Accountable to ensure technical integrity of thermo-fluid design of all applicable engine subcomponents, i.e. turbine, combustor, exhaust nozzle, lubrication system, fuel system, bleed systems, etc.
- Chief reviewer on technical documentation deliverables across all disciplines
- Later System Engineer on core engine, responsible for requirements, verification and technical review management
- Test execution support
- Test data evaluation and model calibration
- Human capital development with client on design process and details

1300 | Prototype aero gas turbine development project | 1 kN class
| Role: Project Manager and System Engineer

Accelerated proof of concept development project, completed in only 7 months, for the design, fabrication, assembly and test of a micro aero gas turbine engine.

- Accountable for total project delivery
- Responsible for overall thermodynamic gas turbine design
- Responsible for all System Engineering functions, i.e. technical requirements specification, trade-off studies, risk analysis, design reviews, etc.
- Responsible for all Project Management functions, i.e. project schedule, cost, resource and task allocations, procurement approvals, reporting, etc.
- Accountable to ensure technical integrity of thermo-fluid design of all applicable engine subcomponents, i.e. turbine, combustor, exhaust nozzle, etc.
- Test execution support
- Test data evaluation and model calibration

Medupi | 6 x 794 MW coal-fired power station | 4th largest coal-fired power station in the world
Kusile | 6 x 798 MW coal-fired power station | largest dry-cooled coal-fired power station in the world
| Role: Lead discipline engineer (main cooling system)

Playing a vital role in the review of designs and providing engineering support during execution of the above projects which ran simultaneously. Directly responsible within Eskom for design compliance and engineering on the plant main cooling system.

- Technical contract negotiations and pre-contract clarifications
- Lead project engineer on cooling system design - responsible for aspects such as technical design reviews (PFD's, P&ID's, HAZOP, drawings, calculations, quality documentation, corrosion protection, etc.), document management, technical correspondence with Contractors and project execution support
- Checking of design calculations / selections of equipment such as motors, gearboxes, fans, pumps, valves, hoists, expansion bellows, etc.
- Review of modelling process and results of computational fluid dynamics (CFD) study done to confirm cooling system contractor performance guarantees
- Ensuring cooling system design compliance to statutory, User Requirement Specification and contractual specifications
- Driving & attendance of desktop design reviews and open engineering issues meetings in order to expedite engineering progress on project
- Reporting to management on project progress
- Quality assurance and periodic quality control on all cooling system related equipment through various inspections
- Review and approval of close-out for manufacturing non-conformances
- Regular visits to construction sites to inspect progress & quality
- Review and approval of site engineering changes and close-out for site non-conformances
- Involved in site construction failure investigation activities
- Supporting site engineers during construction and commissioning project phases
- Evaluation of procedures for expediting of site commissioning activities
- On-site support of commissioning activities

Solar 1 CSP | 100 MW concentrated solar power | Eskom's first large-scale solar energy project
| Role: Lead discipline engineer (main cooling system)

- Direct technical responsibility within Eskom to deliver cooling system design on this project
- Review of documentation generated by Owner's Engineer pertaining to meteorological site data, cooling system design, structure of specifications, concept design, basic design, performance guarantee & testing, functional specification, etc.
- Tender clarifications

Solar Augmentation | Augmentation of various coal-fired power stations with concentrated solar power
| Role: Discipline engineer

- Consulting role for the review of the concept design and User Requirement Specification, compiled by a Consulting Engineering firm

Combined Cycle Gas Turbine | Various CCGT projects
| Role: Discipline engineer (main cooling system)

- Consulting role for the review of technology selections for the main cooling water system, compiled by a Consulting Engineering firm

General work experience

- Modelling of aero gas turbine cycles
- Aero gas turbine detail design
- Development of project schedules and cost projections
- Development planning to advance technology readiness levels for aero gas turbines
- Technical report writing, review and approval on gas turbine design
- Technical evaluation of power plant cooling system designs and cooling system alternatives
- Modelling of power plant thermal cycles
- Obtaining, processing and summarizing meteorological data at specific sites earmarked for new-build power stations, to be used as basis for the cooling system design of the plant
- Utilizing and development of software tools for the technical evaluation of Air-cooled condensers
- Writing of technical reports on a variety of topics related to the cooling system design of a power station
- Technical tender evaluation for the re-pack of wet cooling towers
- Technical tender evaluation for sub-contracting external project management / engineering houses
- Establishing & driving strategic research initiatives with Universities
- Providing input to Eskom corporate governance processes & documentation

Practical experience

Practical experience on testing of aero gas turbines.

- Test bench development and equipment requirements
- Measurement requirements and test setup overview
- Development and sign-off on sub-system acceptance test procedures
- Troubleshooting during ignition, start-up and operation
- Test campaign execution and support
- Data analysis to inform test sequence changes

Practical experience obtained at several of Eskom's currently running coal-fired power stations, as well as during quality inspections on projects.

- Troubleshooting and visual inspection to assist during plant start-up
- Temperature measurements and visual inspection of plant weather mast
- Operation & maintenance practices
- Plant commissioning
- Quality inspections of manufactured heat exchanger bundles (GEA, SPX), fans (Howden), gearboxes (Hansen), motors (Alstom), fan casings (W-tech), Valves (Premier), Tanks (NECSA, VBV Holdings), expansion bellows (Steinmuller), ducting, piping & structural steel (Cadcon, Hydra-arc, Kentz, Robor), cleaning system (J & W Systems), hoists (Condra), elevators (Libra-Plant), ejector system (SVS)

Management experience

- Management of individuals within the Thermo-fluids division as well as annual budget
- Management of the Thermo-fluids division's technical deliverables to all projects
- Project Manager on 1300 prototype aero gas turbine development project
- Management, coaching & mentoring of a number of Engineers in the Turbine Plant department
- Management of multi-disciplinary engineering, project and other stakeholders during project
- Management of cooling system plant design reviews, documentation, correspondences and transmittals for projects

- o Management of contracts with department service providers regarding corrosion protection
- o Management of purchasing process regarding testing of heat exchangers & fan blades

Training

- o Engineering training courses & seminars on Turbine Plant equipment, solar energy integration with coal-fired power stations, cooling systems, pumps, condensers, feed-water heaters, valves, materials, corrosion & tribology
- o Eskom internal courses on Pressure Equipment Regulation (PER), NEC contracts, integrated risk management, mentoring & coaching, ethics & safety (OHS Act, working at heights)
- o Power plant modelling software courses (STEAMPRO, GTPRO, Thermoflex, Flownex)

Qualifications

2001	B Eng (Mech)	University of Stellenbosch, South Africa
2004	MSc Eng (Mech)	University of Stellenbosch, South Africa
2007	PhD (Mech Eng)	University of Stellenbosch, South Africa

Master's Thesis

Title Solar Tower Power Plant Performance Characteristics

Doctoral Dissertation

Title Optimization and Control of a Large-scale Solar Chimney Power Plant

Publications and Conference contributions

2004

Pretorius, J.P., Kröger, D.G., Buys, J.D. and Von Backström, T.W., 2004, "Solar Tower Power Plant Performance Characteristics," Proceedings of the ISES EuroSun2004 International Sonnenforum, Vol. 1, pp. 870-879, Freiburg, Germany, PSE GmbH, Freiburg

2005

Pretorius, J.P. and Kröger, D.G., 2005, "Thermal-flow Analysis of a Solar Chimney Power Plant," Proceedings of the Fourth International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT 2005), Cairo, Egypt

2006

Pretorius, J.P. and Kröger, D.G., 2006, "Critical Evaluation of Solar Chimney Power Plant Performance," Solar Energy, Vol. 80, No. 5, pp. 535-544

Pretorius, J.P. and Kröger, D.G., 2006, "Solar Chimney Power Plant Performance," ASME Journal of Solar Energy Engineering, Vol. 128, No. 3, pp. 302-311

Fluri, T.P., Pretorius, J.P., Van Dyk, C., Von Backström, T.W., Kröger, D.G. and Van Zijl, G.P.A.G., 2006, "Cost Analysis of Solar Chimney Power Plants," ISES EuroSun2006 Solar Congress, Glasgow, Scotland

Pretorius, J.P. and Kröger, D.G., 2006, "Thermo-economic Optimization of a Solar Chimney Power Plant," 17th International Congress of Chemical and Process Engineering (CHISA 2006), Prague, Czech Republic

2007

Pretorius, J.P. and Kröger, D.G., 2007, "Sensitivity Analysis of the Operating and Technical Specifications of a Solar Chimney Power Plant," ASME Journal of Solar Energy Engineering, Vol. 129, pp. 171-178

2008

Pretorius, J.P. and Kröger, D.G., 2008, "Incorporating Vegetation under the Collector Roof of a Solar Chimney Power Plant," South African Institution of Mechanical Engineering, R&D Journal, Vol. 24, No. 1, pp. 3-11

Pretorius, J.P. and Kröger, D.G., 2008, "Thermoeconomic Optimization of a Solar Chimney Power Plant," ASME Journal of Solar Energy Engineering, Vol. 130, No. 2, paper no. 021015, pp. 1-9

Fluri, T.P., Pretorius, J.P., Van Dyk, C., Von Backström, T.W., Kröger, D.G. and Van Zijl, G.P.A.G., 2008, "Cost Analysis of Solar Chimney Power Plants," Solar Energy, Vol. 83, No. 2, pp. 246-256

2009

Pretorius, J.P. and Kröger, D.G., 2009, "Influence of Environment on Solar Chimney Power Plant Performance," South African Institution of Mechanical Engineering, R&D Journal, Vol. 25, pp. 1-9

Pretorius, J.P. and Kröger, D.G., 2009, "Regulating Solar Chimney Power Plant Output According to Demand," Proceedings of the ISES 2009 Solar World Congress, pp. 1075-1084, Johannesburg, South Africa

Pretorius, J.P. and Du Preez, A.F., 2009, "Eskom cooling technologies," 14th IAHR Cooling tower and Air-cooled heat exchanger conference, Stellenbosch, South Africa (presentation only)

Du Preez, A.F. and Pretorius, J.P., 2009, "Specifications for large Air-cooled Condensers – Eskom perspective" 14th IAHR Cooling tower and Air-cooled heat exchanger conference, Stellenbosch, South Africa (presentation only)

2010

Pretorius, J.P. and Kröger, D.G., 2010, "Basic theory and numerical simulation of large-scale solar updraft power plants," Proceedings of the 2nd International Conference on Solar Chimney Power Technology, Keynote Address, pp. 46-53, Bochum, Germany

2012

Pretorius, J.P., 2012, "Eskom perspective on specifications for large Air-cooled Condensers, 4th ACC user's group meeting, Gillette, Wyoming, USA (presentation only)

Pretorius, J.P., 2012, "Realistic ambient air temperature specification for Air-cooled Condensers, 4th ACC user's group meeting, Gillette, Wyoming, USA (presentation only)

2013

Pretorius, J.P. and Du Preez, A.F., 2013, "Case study of dry-cooling in South Africa," Thermal Power Plant Cooling: Context and Engineering, ASME Press

2014

Van der Westhuizen, J., Hoffmann, J., and Pretorius, J.P., 2014, "Liquid extraction on Air-cooled Condenser steam ducts," 9th South African Conference on Computational and Applied Mechanics (SACAM2014), Somerset-West, South Africa

Gosai, P., Malan, A.G., and Pretorius, J.P., 2014, "Cooling system augmentation to enable power plants to meet peak demand in adverse atmospheric conditions," Power-Gen Africa Conference, Cape Town, South Africa

2015

Pretorius, J.P., 2015, "Experience with Medupi and Kusile ACC's – Technical challenges and successes," Eskom Power Plant Engineering Institute student workshop, Keynote lecture, Johannesburg, South Africa

Pretorius, J.P., and Rosslee, P., 2015, "Medupi Unit 6 ACC hot cleaning: Method and results," International Conference on Air-Cooled Condensers, Xi'an, China (presentation preparation only)

2017

Pretorius, J.P. and Yoko, M., 2016, "Gas-Turbine Sub-Component Development and Analysis using ANSYS Fluids 18: Compressor and Combustor," Qfinsoft Engineering Simulation Conference, Somerset-West, South Africa (presentation only)

2018

Pretorius, J.P., 2018, "Accelerated Development of a Micro Gas Turbine for Aerospace Applications," Qfinsoft Engineering Simulation Conference, Somerset-West, South Africa (presentation only)

Pretorius, J.P., 2018, "Accelerated Development of a Micro Gas Turbine for Aerospace Applications," Aeronautical Society of South Africa Annual Conference, Somerset-West, South Africa (presentation only)

Special experience & contributions

- Proposal reviewer for US Electric Power Research Institute (EPRI) and National Research Foundation's (NSF) joint research program on Advanced Dry-cooling for power plants
- Technical consulting on Solar Chimney technology & simulation for the German company Schlaich Bergemann Solar in 2011-2012
- External examiner for:
 - PhD dissertation on condenser tube fouling (University of Stellenbosch, 2017)
 - Master's thesis on novel Solar CSP technology (University of Stellenbosch, 2013)
 - Master's thesis on novel Solar CSP energy storage technology (University of Stellenbosch, 2010)
- Industrial mentor for 3 Master's students participating in Eskom Power Plant Engineering Institute (EPPEI) program in 2012-2013
- Reviewer of paper on Solar Chimney technology for Journal of Thermal Engineering in 2019
- Reviewer of paper on fan research for the ASME TurboExpo in 2017
- Industry contributor to University of Stellenbosch Department of Mechanical and Mechatronic Engineering's final year role model function in 2014 and 2017

Awards

ΔV Aerospace	Detlev Kröger Excellence award in Thermo-fluids (2017)
Eskom	Group Technology Engineering Manager's Awards – Winner for Innovation (2015)
Eskom	Generation Business Engineering Management award for Innovation (2009)
Eskom	Generation Business Engineering Manager's Awards – 1 st runner-up for Excellence (2009)
SASOL	Best post-graduate student in Mechanical Engineering (2006)

Software literacy

● ANSYS Fluids ● GasTurb ● MS Excel VBA ● MS Office ● Matlab ● ARAS PLM System ● Project Insight ● MS Visual Basic ● SteamPRO ● Flownex ● SmartPlant Foundation ● Citrix PowrTrak ● SharePoint

Languages

Fluent in English & Afrikaans spoken and written language