

# Martin Philip Venter

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## Personal Profile

I am a researcher with experience developing methodologies for numerical prototyping and material characterisation investigating applications for compliant inflatable structures in a variety of industries. .

## Education

2011–2015 **Doctor of Philosophy in Engineering**, *Stellenbosch University*.

2009–2011 **Master of Science in Mechanical Engineering**, *Stellenbosch University*.

2005–2008 **Bachelor of Engineering in Mechatronic Engineering**, *Stellenbosch University*.

### Short Courses

2017 **Machine Learning**, *Stanford University*.

2016 **Introduction to Data Science in Python**, *University of Michigan*.

2016 **Applied Data Science with Python**, *University of Michigan*.

2015 **R Programming**, *Johns Hopkins University*.

2015 **The Data Scientist's Toolbox**, *Johns Hopkins University*.

## Doctoral Dissertation

Title *Development of a Methodology for Numerical Prototyping of Inflatable Dunnage Bags*

Promoter Prof. Gerhard Venter

**Description** This thesis develops a numerical model for an inflatable dunnage bag. A key focus is the characterisation of the woven polypropylene textile composite reinforcing cover of the bag. The response of material and the overall bag are validated with physical tests.

Detailed achievements:

- Developed a simple method for measuring the response of plain woven textile composites to bi-axial loading using digital image correlation.
- Developed a method of matching the measured and simulated load-unload response of plain woven polypropylene by characterising two material models using an inverse method.
- A numerical model was developed that suitably accounts for the material plasticity in the loaded polypropylene and the PV-work done by the compressed inflation medium.
- The numerical model was successfully used to match the response of the entire dunnage bag to a standard compression cycle test used in industry.
- The restraining-load produced by the bag and the pressure drop in the bag as a result of plastic deformation in the woven material was captured to within 5 % of measured values.

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## Experience

September 2017–**Senior Lecturer**, STELLENBOSCH UNIVERSITY, Stellenbosch.

Present

May 2015–**Lecturer**, STELLENBOSCH UNIVERSITY, Stellenbosch.

August 2017

May 2014–**Research Engineer**, VORTEX INNOVATION WORX, Cape Town.

April 2015

Jan–Jul **Part-Time Lecturer**, STELLENBOSCH UNIVERSITY, Stellenbosch.

2011–2014

2005–2007 **Student Engineer**, HULAMIN, Pietermaritzburg.

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## Community Interaction

**SAIMechE** Since 2015 I have been actively involved with The South African Institution of Mechanical Engineering where I now sit as the chairman of the branch committee for the Western Cape region. In addition I sit on the National council of SAIMechE

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## Technical Skills

|              |   |
|--------------|---|
| Basic        | Electronic Design, Automation, Administration   |
| Intermediate | Digital Image Correlation, Mechanical Design, Optimisation, Communication and Presentation, Teaching, Inverse Methods, Woven Textiles, Textile Composites |
| Advanced     | Structural Simulation, Finite Element Methods, Materials Testing, Strain Gauge Testing  |

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## Software Skills

|              |   |
|--------------|---|
| Basic        | C   |
| Intermediate | PYTHON, L <sup>A</sup> T <sub>E</sub> X, OpenOffice, Linux, MSC.MARC/MENTAT, AUTODESK INVENTOR, LAVISION DAVIS, PATRAN, NX-NASTRAN, R |
| Advanced     | NASTRAN, SIMXPRT, LS-DYNA, LS-OPT   |

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## Languages

|           |              |                                    |
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| English   | Mothertongue |                                    |
| Afrikaans | Intermediate | <i>Con conversationally fluent</i> |

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## Publications

Venter MP and Venter G, *A Numerical Evaluation of Dunnage Bag Pressure Drop Subject to a Single Void Reduction Cycle*. R & D Journal of the South African Institution of Mechanical Engineering, 2017, 33, 42-48.

Jekel CF, Venter G and Venter MP, *Modeling PVC-coated polyester as a hypoelastic non-linear orthotropic material*. Composite Structures, 2017, 161, 51-64. Doi:compstruct.2016.11.019

Venter MP and Venter G, *Simple implementation of plain woven polypropylene fabric*. Journal of Industrial Textiles, 2016, Advance online publication. Doi:10.1177/1528083716665627.

Jekel CF, Venter G and Venter MP, *Obtaining a hyperelastic non-linear orthotropic material model via inverse bubble inflation analysis*. Structural and Multidisciplinary Optimization, 2016, 54, 927-935, doi:10.1007/s00158-016-1456-8

Venter MP, *A methodology for numerical prototyping of inflatable dunnage bags*. Ph.D Thesis, Faculty of Engineering at Stellenbosch University, Stellenbosch, South Africa, 2015.

Venter MP and Venter G, *Development and Validation of a Numerical Model for an Inflatable Paper Dunnage Bag*. Packaging Technology and Science, 2012, Vol. 25, 467-483.

Venter MP and Venter G, *Numerical Replica of a Dunnage Bag Certification Test*. Conference: 10th South African Conference on Computational and Applied Mechanics, At Faculty of Engineering, North-West University, Potchefstroom, South Africa, 2016.

Ellis DR, Venter MP and Venter G, *Methodology for the Mechanical Characterisation of Uncoated Woven Polymer Textiles*. Conference: 10th South African Conference on Computational and Applied Mechanics, At Faculty of Engineering, North-West University, Potchefstroom, South Africa, 2016.

Ludick DJ, Venter MP, Davidson DB and Venter G, *A multiphysics analysis of dish reflector antennas for radio astronomy applications*. Conference: 10th European Conference on Antennas and Propagation (EuCAP), Davos, Switzerland, 2016.

Venter MP and Venter G, *Simulating Pressure Loss in an Inflated Structure due to Material Load/Unload Characteristics*. Conference: VII International Conference on Textile Composites and Inflatable Structures, At Barcelona, Spain, 2015.

Venter MP and Venter G, *Modelling of an Inflatable Structure*. Conference: Third African Conference on Computational Mechanics, At Livingston, Zambia, 2013.

## Students

- 2016 **M.Eng**, CJ JEKEL, Obtaining non-linear orthotropic material models for PVC-coated polyester via inverse bubble inflation.
- 2016 **M.Eng**, WB VAN BLOMMESTEIN, Experimentally determined material parameters for temperature prediction of an automobile tire using finite element analysis.
- 2017 **M.Eng**, DR ELLIS, Mechanical characterisation for simplified response modelling of woven polypropylene.
- 2018 **M.Eng**, I VAN JAARVELD, Modelling of polymer seal strength: response surface methodology approach.
- 2018 **M.Eng**, TS STEELE, Combined structural and electromagnetic analysis of dish reflector antennas.