



Curriculum Vitae

Niklas Järvstråt, PhD

University West
Department of Technology, Mathematics and Computer Science
461 86 Trollhättan
Sweden
Phone: +46 520 22 33 27
Fax: +46 520 22 32 99
Niklas.jarvstrat@hv.se

- 1994 **Doctor of Philosophy** in the area of Solid Mechanics and Strength of Materials. Linköping Institute of Technology.
Dissertation: "Calculation of thermally induced stress and distortion in extruded aluminium and short fibre composites", Linköping studies in science and technology. Dissertation No. 349, Linköping, 1994.
- 1990 **Licentiate Degree** in the area of Solid Mechanics and Strength of Materials. Linköping Institute of Technology.
Thesis: "Two-Dimensional calculation of quench stresses in steel", Linköping Studies in Science and Technology, Thesis No. 245, LiU-Tek-Lic-1990:45, Linköping.
- 1985 **Master of Science** in Applied Physics and Electrical Engineering, Major in Solid Mechanics. Linköping Institute of Technology.

Employment

- 2001- **Associate Professor**, Materials technology, *University West*
Department of Technology, Mathematics and Computer Science

Current Areas of Research

Material mechanics: High temperature mechanical behaviour of metals with emphasis on welding, heat treatment and machining.

Metallurgy simulation in FEM: Phase transformations and grain growth in steel, aluminium and super alloys, along with the effect of phase content and other metallurgical properties on deformation and structural integrity.

Validation of models for mechanical behaviour: Focussing on material properties of solid metal during welding, with coupled temperature-metallurgy-stress calculation including transformation plasticity.

Self-sufficient manufacturing systems: Application to disaster relief, resource lean manufacturing and moon colonisation.

1996-2001 **Senior Scientist, Volvo Aero Corporation**
Responsible for research and methods development for engine component life assessment. Implemented first company wide quality system for design life assessment.

1994-96 **Design Engineer, Volvo Aero Corporation**

1992-94 **Industrial Researcher, Hydro Aluminium**

1987-92 **PhD Research and teaching, Solid Mechanics**
Linköping Institute of Technology

1985-87 **PhD Research and teaching, Applied Mathematics**
Linköping Institute of Technology

Current Appointments

- Head of The Swedish Manufacturing Research and Technology Centre (SMART-Centre)
- Associate Professor, Applied Mechanics, Chalmers University
- Researcher, Welding technology, Royal Institute of Technology

Awards, Fellowships and Previous Appointments

- One of the founders, and Vice Chairman of UTMIS (Utmattningsnätverket i Sverige): Swedish Fatigue Network (2000-2002)
- Swedish contact for ESIS – the European Structural Integrity Society. (2001-2002)
- Member of AIAA Space Colonization Technical Committee
- One of first 15 in board of advisors, Moon Society
- Member of scientific advisory board, Lifeboat Foundation
- Member of ASM American Society for Metals
- Member of Mensa
- Volvo Aero Jet Engine Components Technical Award 2001, for development and implementation of life assessment quality procedures at the company
- Speaker at international technology management conferences
- Established a major national conference on life prediction procedure and theory, which was arranged for the 11th consecutive year in October 2005
- Established a national conference on manufacturing engineering, run for the first time in September 2005

Project management: National and International

Research area responsibility

Current Projects

- European framework 6 project: Virtual Engineering for Robust Manufacturing with Design Integration. Project responsible for University West, supervisor of one PhD Student
- KK-foundation project: Formation and detection of weld defects related to solidification and cooling. Project co-ordinator, supervisor of one PhD student
- National Graduate School for Materials Science: MAX Phase Materials. Technical responsible for University West, supervisor of one PhD student
- National Graduate School for Materials Science: Influence of materials properties on machinability of superalloys. Technical responsible for University West, supervisor of one PhD student
- KK-foundation project: Arc modelling for robust tandem-arc welding. In project steering committee

Representing Volvo Aero Corporation in European projects in framework 4 and 5

- GRD1-1999-11077 “High performance approach to fatigue crack analysis and life prediction”. Technically responsible for VAC, 2000-2002.
- BE96-3311 Advanced tools for failure prediction in TBC coated and uncoated single crystal superalloys (European Commission funded project). Technically responsible for VAC 1997-2000.
- BREU6021 Development of an understanding of materials properties under the combined influence of creep, fatigue and oxidation (European

Commission funded project). Project administration (for VAC) and scientific work 1994-1997.

National Fatigue Research Projects.

- NFFP2.15 Förbättrad livslängdsanalys för heta delar i flygmotorer. (University research project at LTH/materialteknik.) Member in steering group 1994-1998.
- Livslängdsberäkning för turbindetaljer (University research project with CTH Solid Mechanics). Member in steering group, 1998-2000.
- NFFP337 Effektiv materialprovning (University research project with LTU/computer aided design och LTH, Department of Mechanics and Materials). Project leader and industrial supervisor for one PhD student at VAC, 1997-2002.
- NFFP347 Riskanalys i livslängdspredikteringar (University research project with CTH Statistics). Project leader and industrial supervisor for one PhD student at VAC, 1997-2002.

Other Proposal Co-ordination

- Co-ordinator for European research proposal "Quality assessment of assumptions in the life prediction of aero engine components (Q-life)", with ten partners. (Evaluated by the European Commission in Framework 5 and was first on the reserve list, but not funded. Renewed effort for FP6.)
- Co-ordinator for international research proposal "Manufacturing for In-Situ Resource Utilisation, Applied to a Self-Sufficient Lunar Colony", that has involved around 60 partners in 13 countries worldwide. The proposal is "abstract endorsed" by the international organisation IMS (Intelligent Manufacturing Systems).

Software Developed

- Material modelling subroutines for modelling heat treatment of steel (TRAST). TRAST is a subroutine system for use with the commercial FEM software ABAQUS (structural mechanics), and licensed to about a dozen companies and research institutes worldwide, e.g. Los Alamos and San Dia research institutes, Ford and Kvaerner, as well as the US Department of Energy.
- Material modelling subroutines for modelling heat treatment of aluminium (ARES). ARES is a subroutine system for use with the commercial FEM software ABAQUS (structural mechanics), and currently Hydro Aluminium proprietary.

Postgraduate Supervision and Teaching

- Currently teaching material mechanics at MSc Level.
- Currently supervising four PhD researchers.
- Carries out definition and supervision of MSc thesis projects.
- Industrial supervisor for licentiate students at Volvo Aero Corporation (1994-2002)

Publications

- Järvstråt, N: "Värmebalansprogram för svävbäddångpanna av MBC-typ", Thesis at Linköping institute of technology, Dept of mechanical engineering, LiTH-IKP-Ex-527, 1985
- Järvstråt, N: "Metal matrix composites: micro stresses, continuum models and homogenization. Literature study.", Report at Linköping institute of technology, Dept of mechanical engineering, LiTH-IKP-R-666, 1989
- Järvstråt, N: "Two-dimensional calculation of quench stresses in steel", in the Licentiate thesis Two-dimensional calculation of quench stresses in steel, Linköping studies in Science and Technology, Thesis No. 245, LIU-TEK-LIC-1990:45, 1990
- Järvstråt, N: "Transformation plasticity during quenching, a numerical comparison of some common models", in the Licentiate thesis Two-dimensional calculation of quench stresses in steel, Linköping studies in Science and Technology, Thesis No. 245, LIU-TEK-LIC-1990:45, 1990
- Sjöström, S & Järvstråt, N: "Two-dimensional calculation of quench stresses in steel: a comparison between two different surface heat flux models", in the Licentiate thesis Two-dimensional calculation of quench stresses in steel, Linköping studies in Science and Technology, Thesis No. 245, LIU-TEK-LIC-1990:45, 1990
- Järvstråt, N: "Two-dimensional calculation of quench stresses in steel", Linköping studies in Science and Technology, Thesis No. 245, LIU-TEK-LIC-1990:45, 1990
- Järvstråt, N: "Homogenization and the mechanical behaviour of metal composites", 28th Polish solid mechanics conference, Kozubnik, 4-8 September 1990
- Järvstråt, N., "Generalised periodic plane strain: bending and twisting deformation in long sections", 6th Nordic Seminar on Computational Mechanics, Linköping, 1993
- Järvstråt, N: "Mechanical behaviour of aluminium under varying temperature; A literature study with emphasis on cooling after extrusion of AlMgSi alloys", Report at Linköping institute of technology, Dept of mechanical engineering, LiTH-IKP-R-781, 1993
- Järvstråt, N: "An ellipsoidal unit cell for the calculation of micro-stresses in short fibre composites", Computational materials science, Vol. 1, No. 3, p103-112, 1993
- Järvstråt, N & Sjöström, S: "Current status of TRAST; a material model subroutine system for the calculation of quench stresses in steel", ABAQUS users' conference 1993, Aachen, Germany, 1993
- Järvstråt, N: "Homogenization and the mechanical behaviour of metal composites", Residual stresses - III Science and technology, Vol. 1, eds. Fujiwara H, Abe T and Tanaka K, Elsevier, p. 70-75, 1993
- Järvstråt, N: "Calculation of thermally induced stress and distortion in extruded aluminium and short fibre composites", Linköping studies in science and technology. Dissertations No. 349, Linköping, 1994
- Järvstråt, N. and Tjøtta, S., "Modelling cooling of aluminium", Proc. ABAQUS Users' Conference, Newport, RI, 1994

- Järvstråt, N & Tjøtta, S: "A material model for the calculation of quench stresses in extruded aluminium sections", Proceedings of the fourth international conference on residual stresses, Baltimore, USA, 1994
- Järvstråt N: "Implementation and accuracy of the radial return method for nonlinear viscoplasticity at varying temperature and strain rate", in the dissertation Calculation of thermally induced stress and distortion in extruded aluminium and short fibre composites, Linköping studies in Science and Technology, Dissertations, No. 348, Paper II, 1994
- Järvstråt N & Sjöström S, TRAST7 User's manual, unpublished document, 1995
- Järvstråt N & Tjøtta S: "A process model for on-line quenching of aluminium extrusions", Metallurgical and materials transactions B, Vol. 25B, 1996
- Järvstråt N & Tjøtta S: "A mechanical material model for aluminium extrusions during on-line quenching", Journal of engineering materials and technology, Vol. 118, 1996
- Sjöqvist R & Järvstråt N: "VpSim - interactive simulation of cyclic viscoplasticity", Fatigue '96, Eds. Lütjering G. and Nowack H., Pergamon press, Berlin, Germany, 1996
- Järvstråt N: "Specializing for partnership - technology development for customer integrated design", invited presentation at Linking marketing strategy with product development to achieve competitive advantage, Singapore, May, 1998
- Andersson H, Persson C & Järvstråt N: "Numerical simulation of viscoplastic crack closure", LCF4, Garmisch-Partenkirchen, Germany, September 1998
- Järvstråt N: "Creating a Lunar Colony", Space News, June 28, 1999
- Lodeby K, Isaksson O & Järvstråt N: "A method for uncertainty quantification in the life prediction of gas turbine components", Fatigue Design and Reliability, Eds. Marquis G & Solin, J, Elsevier, Amsterdam, The Netherlands, 1999
- Salomonsson A., Järvstråt N. & Lindgren L-E, "Choice of cost-function in material parameter determination leading to variation in stress prediction", IRF99, Porto, Portugal, Juli 1999
- Järvstråt, N: "Technology roadmaps at Volvo Aero - from current expertise to future business goals." Invited presentation at Strategies for Innovation: The Technology/Market Interface, London, July, 1999
- Marchioni M., Onofrio G., Fischervorring-Bunk A. & Järvstråt N.: "High temperature low cycle fatigue and fatigue crack growth behaviour of the Udimet720Li alloy", Euromat99, Munich, Sept 1999
- Salomonsson A. & Järvstråt N., "An alternative derivation of the effective stress function method with an extension to transverse recovery", to be submitted for publication. Included in the Licentiate Thesis "Accuracy of Material Parameter Estimation", by Anders Salomonsson, 2000-04-04
- Järvstråt, N., "Quality of life: activities at Volvo Aero Corporation to assess and improve the accuracy of assumptions and methods employed in calculating the service life of aero engine components", in Damage and Fracture Mechanics IV, eds. Selvadurai A.P.S. & Brebbia C.A., WIT press, Southampton, 2000, pp. 375-381

- Lodeby, K. & Järvstråt N., "Using inspection data to improve credibility of analytical life predictions", presented at ICOSSAR 01 (International Conference on Structural Safety and Reliability), 2001
- Järvstråt, N., "Flödesinstruktion för livslängdsanalyser", Normative document at Volvo Aero Corporation: V.AC:181772, 2001
- Järvstråt, N., "Metodinstruktion för livslängdsanalys: Spänningsanalys(5)", Normative document at Volvo Aero Corporation: V.AC:181779, 2001
- Järvstråt, N., "Lunar colonisation - why, how and when?", Invited contribution, Ad Astra, Volume 14, Number 2 March/April 2002 (<http://www.moon-isru.com/10213AA32.pdf>, <http://www.moon-isru.com/10213AA33.pdf> and <http://www.moon-isru.com/10213AA34.pdf>)
- Järvstråt, N., "A generalisation of Gittus 'Mechanical Equation of State' to multi-axial stress states", Mechanics of Materials 34, pp773-777, 2002
- Järvstråt, N., "What Manufacturing Facilities are Required for a Moon Colony to survive without supplies from Earth?", presented at ISDC02 - International Space Development Conference 2002, in Denver, Colorado, May 23-27, 2002
- Järvstråt, N., "Requirements on crack propagation tools for aero engine gas turbine components", presented at WCCM V - Fifth World Congress on Computational Mechanics in Austria, July 7-12, 2002 (<http://wccm.tuwien.ac.at/cgi-bin/wccm/showDB.pl?showContribution&id=81526>)
- Järvstråt, N., "Future development potential for the cohesive element method", presented at WCCM V - Fifth World Congress on Computational Mechanics in Austria, July 7-12, 2002 (<http://wccm.tuwien.ac.at/cgi-bin/wccm/showDB.pl?showContribution&id=81527>)
- Toklu, C. & Järvstråt, N., "Design and construction of a self sustainable lunar colony with in-situ resource utilisation", presented at ISPE/CE2003 Conference and Exhibition 10th ISPE International Conference On Concurrent Engineering: Research And Applications, Funchal, Portugal, July 26 - 30, 2003
- Järvstråt, N., "Towards the Ultimate Self Sustainable Society – Manufacture System Design for In-Situ Resource Utilization in a "Moon Colony"", presented at ISPE/CE2003 Conference and Exhibition 10th ISPE International Conference On Concurrent Engineering: Research And Applications, Funchal, Portugal, July 26 - 30, 2003
- Andersson, H., Persson, C., Hansson, T., Melin, S. & Järvstråt, N.: "Constitutive Dependence in Finite Element Modelling of Crack Closure During Fatigue"; included in Andersson, H.: "Fatigue Behaviour of a Nickel Based Superalloy", Lund University of Technology, Doctoral Thesis; To appear in Fatigue & Fracture of Engineering Materials & Structures
- Järvstråt, N., "On the danger of constitutive models and parameters with insufficient validation", Benchmark, January 2004
- Järvstråt, N. & Toklu, C.: "Design and Construction for Self-sufficiency in a Lunar Colony", Proceedings of the third international conference on advances in structural engineering and mechanics (Invited lecture), pp. 110-122, Techno-Press, 2004
- Lorentzon, J. & Järvstråt, N.: "Validation of Neuber's rule using notched test specimens", The third international conference on advances in

structural engineering and mechanics (abstract, contributed paper), 2-4 September, Seoul, South Korea, 2004 and Sixth world congress on computational mechanics, 6-10 September, 2004, Beijing, China

- Järvstråt, N.: "A process view on manufacture process development", Computational Mechanics – proceedings of the sixth world congress on computational mechanics, pp. 375-379, Springer Verlag, 2004
- M. Farajian-Sohi, N. Järvstråt: "A fractographical investigation of weld toe imperfections in Tandem MAG welding", accepted for publication in Steel Research International
- Farajihan-Sohi, M., Järvstråt, N. & Thuvander, M.: "Effect of Welding Parameters on Formation of Toe Imperfections in Tandem Gas Metal Arc Welding", 7th International Conference on Trends in Welding Research Conference, May 16-20, 2005
- Farajihan-Sohi, M., Järvstråt, N.: "Formation and detection of weld toe imperfections in tandem gas metal arc welding", , IIW 2005 - Prague
- Järvstråt, N. "Towards the Ultimate Self Sustainable Society - Modelling In-Situ Resource Utilisation for an isolated "Lunar" community", proceedings of International Conference of Energy, Environment and Disasters, July 24-30, 2005, Charlotte, USA
- J. Lorentzon, T. Beno, N. Järvstråt: "Finite element simulation of tool wear in turning of Inconel 718", Proceedings of Leading Edge Manufacturing in 21st Century, LEM21, Nagoya, Japan. October 19-22, 2005
- Proceedings: "Livslängdsanalys vid Volvo Aero 1995", 76 participants. (editor)
- Proceedings: "Livslängdsanalys vid Volvo Aero 1996", 69 participants. (editor)
- Proceedings: "Livslängdsanalys vid Volvo Aero 1997", 49 participants. (editor)
- Proceedings: "Livslängdsanalys vid Volvo Aero 1998", 85 participants. (editor)
- Proceedings: "Livslängdsanalys vid Volvo Aero 1999", 58 participants. (editor)
- Proceedings: "Livslängdsanalys vid Volvo Aero 2000", 78 participants (editor)
- Proceedings: "UTMIS livslängdsanalysdag 2001", 64 participants (editor)
- Proceedings: "UTMIS livslängdsanalysdag 2002", 70 participants (editor)
- Proceedings: "UTMIS livslängdsanalysdag 2003", 81 participants (editor)
- Proceedings: "UTMIS livslängdsanalysdag 2004", 106 participants (editor)
- Proceedings: "SMART-dagar 2005", 83 participants (editor)