

## **Main activities of Professor Paulo M. S. Tavares de Castro in Sept. 2009 – August 2010, corresponding to a period of sabbatical leave**

Faculdade de Engenharia da Universidade do Porto,  
December 5, 2010

This document is based on the **yearly report of activities for 2009**, (yearly reports available, since 1996, in [www.fe.up.pt/~ptcastro](http://www.fe.up.pt/~ptcastro)), and on a preliminary version of the **2010 yearly report** to be made public on Dec. 31, 2010. An attempt was made to extract from those two documents the data corresponding to the Sept. 2009 – August 2010 period.

### **R&D projects in the period**

- ESA, Technology and Research Programme “Damage tolerance of cryogenic pressure vessels”, coord. MT-Aerospace (with INEGI), 2008-2009;
- FCT PTDC/EME-TME/66362/2006, “WELDING – Fiber Bragg grating sensors for modeling of friction stir welding (FSW) and laser beam welding (LBW)”, contract, July 2007 - June 2009, closure extended to December 2009;
- MIT-Portugal Programme, “New design concepts for aeronautical products welded by friction stir”, 2007 – 2010;
- FCT PTDC/EME-PME/100204/2008, “Railways - rolling contact fatigue”, with IST (Manuel Freitas *et al.*) and FCTUC (A. D. Castanhola Batista *et al.*); started 2010;
- FCT PTDC/ECM/69697/2006, “Advanced methodologies for the assessment of the dynamic behaviour of high speed railway bridges”, coordinator: Prof Rui Calçada, DEC-FEUP;

### **Industry projects (main)**

- WEG, on mechanical behavior of copper alloys, with Dr. Pedro M.G.P. Moreira (INEGI) and Eng. M.A.V. de Figueiredo (LET-DEMec-FEUP);
- CaetanoBus, on experimental behavior of structural connections and sandwich panels, with Dr. Pedro M.G.P. Moreira (INEGI) and Eng. M.A.V. de Figueiredo (LET-DEMec-FEUP).

### **Supervision of doctorates (current)**

- Sérgio M.O. Tavares, “New design concepts for aeronautical products welded by friction stir”, FEUP – Doctoral Programme in Leaders for Technological Industries (MIT-Portugal Programme, focus Engineering Design and Advanced Manufacturing – EDAM); supervisor: Paulo MST de Castro; co-supervisors: Pedro Vilaça (IST), Jorge dos Santos (GKSS, Germany). Start: Sept. 2007;
- Valentin J. Richter-Trummer, “Integrated design solutions for structures manufactured with FSW, including effects of residual stresses and damage tolerance criteria”, FEUP, Doctoral Programme in Mechanical Engineering, supervisor: Paulo M.S.T. de Castro; co-supervisors Pedro Vilaça (IST), Jorge dos Santos (GKSS, Germany). Start: March 2008;
- Carlos M.C. Albuquerque, Advanced methodologies for fatigue analysis of high speed railways bridges; FEUP Doctoral Programme in Civil Engineering; supervisor: Rui Calçada (Depart. of Civil Engng., FEUP); co supervisor: Paulo M.S.T. de Castro. Start 2008.
- Plácido M.P. Afonso, Relationships between S&T research and design in Portugal and Finland; FEUP Doctoral Programme in Industrial Engineering and Management; work at FEUP and Taideteollinen korkeakoulu Helsinki (University of Art and Design Helsinki); superv. In Finland: Tapio Yli-Viikari; FEUP supervisor: A. Torres Marques; FEUP co-supervisor: P.M.S.T. de Castro. Start: Oct. 2008.
- Daniel F.C. Peixoto, Railways - rolling contact fatigue; FEUP, Doctoral Programme in Mechanical Engineering, supervisor: Paulo M. S. T. de Castro; co-supervisor Luís A. A. Ferreira. Star: October 2009.

### **Master degrees supervised in the period**

- Pedro Barbosa Ribeiro, ‘Competitividade de máquinas-ferramenta – Conceitos inovadores aplicados a uma quinadora’, Master in Mechanical Engineering, FEUP, **February 2010**, (work carried out at ADIRA); supervisors: Eng. T. Faro, ADIRA, Prof. Abel Dias dos Santos, FEUP, and Prof. P.M.S.T. de Castro, FEUP.

- André F.S. Ramos, 'Estudo de metodologias de análise e a sua aplicação prática na optimização e fabricação de carroçarias de autocarros', Master in Mechanical Engineering, FEUP, **July 2010** (work carried out at CaetanoBus); supervisors: Eng. F. Fernandes, CaetanoBus, Dr. Pedro M.G.P. Moreira, INEGI, and Prof. P.M.S.T. de Castro, FEUP.
- Bruno Santos, 'Optimização de máquina laser', Master in Mechanical Engineering, FEUP, **July 2010**, (work carried out at ADIRA); supervisors: Eng. J. Figueira, ADIRA, Dr. Pedro M.G.P. Moreira, INEGI, and Prof. P.M.S.T. de Castro, FEUP.
- Carlos M.C.G. Fernandes, 'Optimização do projecto de processos para produção sde protótipos', Master in Mechanical Engineering, FEUP, **July 2010** (work carried out at EDAETECH); supervisors: Eng. A. Morais, EDAETECH, Prof. Mário A.P. Vaz and Prof. P.M.S.T. de Castro, FEUP.
- Roberto M.C. Miranda, 'Study of fatigue crack propagation in metallic structures', Master in Mechanical Engineering, FEUP, **July 2010**, supervisors: Eng. Miguel A.V. de Figueiredo, Prof. P.M.S.T. de Castro.
- Rui Pedro Vieira Garrido, 'Modelação de autocarros em elementos finitos' Master in Mechanical Engineering, FEUP, **July 2010** (work carried out at CaetanoBus); supervisors: Eng. F. Fernandes, CaetanoBus, Dr. Pedro M.G.P. Moreira, INEGI, and Prof. P.M.S.T. de Castro, FEUP.

**Publications listed by alphabetical sequence of first co-author (roughly in the Sept. 2009 – August 2010 period)**

- D.F.C. Peixoto, L.A.A. Ferreira, P.M.S.T. de Castro, 'Application of the Dang Van fatigue criterion to the rail/wheel contact problem', *Materials Science Forum*, vols. 636-637, 2010, pp.1178-1185.
- D.F.C. Peixoto, L.A. Ferreira, P.M.S.T. de Castro, "O critério de Dang Van para dimensionamento à fadiga: comparação com outros critérios", *Manutenção*, nº101, 2º trimestre 2009, pp.22-27.
- P.M.G.P. Moreira, S.D. Pastrama, P.M.S.T. de Castro, 'Three-dimensional stress intensity factor calibration for a stiffened cracked plate', *Engineering Fracture Mechanics*, vol.76, (14), Sept. 2009, pp.2298-2308.
- P.M.G.P. Moreira, V. Richter-Trummer, R.A.M. da Silva, M.A.V. de Figueiredo, P.M.S.T. de Castro, 'Residual stress evaluation of a MIG butt welded aluminium alloy plate', *Mecânica Experimental*, (17), 2009, pp.29-39
- P.M.G.P. Moreira, V. Richter-Trummer, S.M.O. Tavares, P.M.S.T. de Castro, 'Characterization of fatigue crack growth rate of AA6056 T651 and T6: Application to predict fatigue behaviour of stiffened panels', *Materials Science Forum*, vols. 636-637, 2010, pp.1511-
- P.M.G.P. Moreira, P.M.S.T. de Castro, 'Fractographic analysis of fatigue crack growth in lightweight integral stiffened panels', *International Journal of Structural Integrity*, vol. 1, (3), 2010, pp.233-258.
- P.M.G.P. Moreira, V. Richter-Trummer, M.A.V. de Figueiredo, P.M.S.T. de Castro, 'Comportamento à fadiga de painéis aeronáuticos fabricados por processos emergentes', *Ciência e Tecnologia dos Materiais*, vol.22, (3/4), 2010, in press,
- P.M.S.T. de Castro, P.P. Camanho, L.F.M. da Silva, P.M.G.P. Moreira, 'IDMEC – Faculdade de Engenharia da Universidade do Porto - Concise presentation with focus on aeronautics R&D', *International Journal of Structural Integrity*, vol.1, (2), 2010, pp.161-172.
- S. M. O. Tavares, V. Richter-Trummer, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Fatigue crack growth modeling in stiffened panels considering residual stress effects', *Materials Science Forum*, vols. 636-637, 2010, pp.1172-1177.
- S.M.O. Tavares, P.M.S.T. de Castro, 'Impact of integral structures in the design for manufacture and assembly of airframes', *Key Engineering Materials*, vol. 450, 2011, pp.279-282.
- S.M.O. Tavares, R.A.S. Castro, V. Richter-Trummer, P. Vilaça, P.M.G.P. Moreira, P.M.S.T. de Castro, 'Friction stir welding of T-joints with dissimilar aluminium alloys: mechanical joint characterisation', *Science and Technology of Welding and Joining*, 2010, vol.15, (4), pp.312-318.
- V. Richter-Trummer, E.A.S. Marques, F.J.P. Chaves, J.M.R.S. Tavares, L.F.M. da Silva, P.M.S.T. de Castro, 'Analysis of crack growth behavior in a double cantilever beam adhesive fracture test by different digital image processing techniques', *Materialwissenschaft und Werkstofftechnik / Materials Science and Engineering Technology*, accepted, 2010.
- V. Richter-Trummer, P.M.G.P. Moreira, P.M.S.T. de Castro, 'Medição de tensões residuais', *Manutenção*, in press,2010.
- V. Richter-Trummer, S.M.O. Tavares, D.F.C. Peixoto, S.O. Silva, O. Frazão, P.M.G.P. Moreira, P.M.S.T. de Castro, 'Welding monitoring using FBG sensors', *International Journal of Advances in Mechanics and Applications of Industrial Materials (AES Technical Reviews Int. J., Part B)* – ISSN 1718-5505, vol.1, (1), 2010, pp.27-33. (revised Fig. 1)
- V. Richter-Trummer, S.O. Silva, D.F.C. Peixoto, O. Frazão, P.M.G.P. Moreira, J.L. Santos, P.M.S.T. de Castro, 'Fibre Bragg grating sensors for monitoring the metal inert gas and friction stir welding processes', *Measurement Science and Technology*, vol. 21, 2010, 085105 (8pp).

### Communications / papers in conferences

- D. F. C. Peixoto, L. A. A. Ferreira, P. M. S. T. de Castro, 'Application of the Dang Van fatigue criterion to the rail/wheel contact problem', paper B2-335, World Tribology Congress 2009, Kyoto, Japan, **Sept. 6-11, 2009**, abstract in: proceedings, p.538.
- S. M. O. Tavares, V. Richter-Trummer, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Fatigue behavior of lightweight integral panels', abstract in: 7th EUROMECH Solid Mechanics Conference, vol. Lectures and General Sessions, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.417-418<sup>1</sup>.
- V. Richter-Trummer, S. M. O. Tavares, D. F. C. Peixoto, S. F. Silva, O. Frazão, P. M. G. P. Moreira, P. M. S. T. de Castro, 'Calibration of Fibre Bragg Grating (FBG) sensors and their use for welding monitoring', abstract in: 7th EUROMECH Solid Mechanics Conference, vol. Lectures and General Sessions, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.331-332.
- V. Richter-Trummer, E. A. Marques, F. J. P. Chaves, J. M. R. S. Tavares, L. F. M. da Silva, P. M. S. T. de Castro, 'Analysis of the crack growth behavior in a double cantilever beam adhesive fracture test using digital image processing techniques', abstract in: 7<sup>th</sup> EUROMECH Solid Mechanics Conference, vol. Mini-Symposia, J. Ambrósio, M. T. Silva, eds., Lisbon, Portugal, **Sept. 7-11, 2009**, pp.223-224.
- S. M. O. Tavares, P. M. S. T. de Castro, 'Advanced manufacturing for improved engineering design: the case of friction stir welding in aeronautics', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **Sept. 14-15, 2009**<sup>2</sup>.
- J. M. A. Estrela, J. Figueira, T. Brito e Faro, P. M. S. T. de Castro, 'Rationalization of the laser cutting machine ADIRA CCL 3015', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **Sept. 14-15, 2009**.
- A. J. J. Gomes, P. M. S. T. de Castro, 'Product development methods and SME's: Tension between formal structured methods and informal approaches', Proceedings of the First International Conference on Integration of Design, Engineering and Management for innovation IDEMI'09, Porto, Portugal, **Sept. 14-15, 2009**.
- M. Windisch, U. Glaser, K.-H. Trautmann, P. M. S. T. de Castro, E. Sattler, "Damage tolerance characterization of 2195 base material and friction stir welds", 11<sup>th</sup> European Spacecraft Structures, Materials and Mechanical Testing Conference (SSMMT), Toulouse, **15-17 Sept. 2009**.  
<http://www.ecssmmt.com/>
- C.M.C. Albuquerque, P.M.S.T. de Castro, R.A.B. Calçada, 'Aplicação da mecânica da fractura no contexto da análise dinâmica de estruturas pelo método da sobreposição modal', Actas do VII Congresso de Construção Metálica e Mista, (L. Simões da Silva et al, eds), LNEC, Lisboa, **Nov. 19-20, 2009**.
- CIFIE 2010 – Iberian Conference on Fracture and Structural Integrity, Porto, FEUP; **March 17-19, 2010**:
  - C.M.C. Albuquerque, P.M.S.T. de Castro, R.A.B. Calçada, 'Aplicação de técnicas de sub-modelação no contexto da análise de propagação de fendas de fadiga em estruturas de grandes dimensões'.
  - D.F.C. Peixoto, L.A.A. Ferreira, P.M.S.T. de Castro, 'Non-linear analysis of the wheel / rail contact'.
  - P.M.G.P Moreira, A.M.P. de Jesus, M.A.V. de Figueiredo, M. Windisch, G. Sinnema, P.M.S.T. de Castro, 'Fatigue crack growth behaviour of friction stir welded aluminium-lithium alloy 2195 T8X'.
  - P.M.G.P. Moreira, V. Richter-Trummer, M.A.V. Figueiredo, P.M.S.T. de Castro, 'Lightweight stiffened panels fabricated using emerging fabrication technologies: fatigue behaviour'.
  - S.M.O. Tavares, P.M.S.T. de Castro, 'Stress intensity factor calibration for a longitudinal crack in a fuselage barrel'.
  - S.M.O. Tavares, V. Richter-Trummer, P.M.G.P. Moreira, P.M.S.T. de Castro, 'Modeling of fatigue crack growth in monolithic integral stiffened panels taking into account residual stress'.

<sup>1</sup> Unfortunately the 'cd' distributed by the organizers of the 7th EUROMECH Solid Mechanics Conference contains a mistake: although the file of this full paper (12 pages) is recorded in the 'cd' (pap\_0758\_GS-MM.pdf in folder papers\GS-MM), in the index it is mistakenly identified as *R. Perales, G. Saussine, F. Radjai 'Optimization of the Tamping Process to Reduce Track Settlement'* ! Furthermore, although the abstract is correctly printed in the proceedings book (J. Ambrósio, M. T. Silva, eds, 'Book of Abstracts, lectures and General Sessions', p.417, in the index of this volume (page xviii) it is again mistakenly identified as *R. Perales et al.* !

<sup>2</sup> Unfortunately the 'cd' distributed by the organizers of IDEMI'09 contains a mistake: although the file of this full paper (14 pages) is recorded in the 'cd', its link to the index is broken, so the paper is not accessible !

- V. Richter-Trummer, P.M.G.P. Moreira, S.D. Pastrama, M.A.P. Vaz, P.M.S.T. de Castro, 'Methodology for in-situ stress intensity factor determination on cracked structures by digital image correlation'.
- D.F.C. Peixoto, L.A.A. Ferreira, P.M.S.T. de Castro, 'Non-linear analysis of the wheel / rail contact', CTF2010 – First International Congress on Rail Transport Technology, Zaragoza, Spain, **April 12-14, 2010**.
- CNME 2010 - 8º Congresso Nacional de Mecânica Experimental, APAET, Univ. Minho, Guimarães, **April 21-23, 2010**:
  - P.M.G.P. Moreira, P.C.M. Azevedo, M.A.V. de Figueiredo, M. Windisch, G. Sinnema, P.M.S.T. de Castro, 'Fracture and fatigue crack growth behavior of friction stir welded AL-Li 2195-T8X'.
  - P.M.S.T. Castro, S.M.O. Tavares, V. Richter-Trummer, P.F.P. de Matos, P.M.G.P. Moreira, L.F.M. da Silva, 'Damage tolerance of aircraft panels'.
  - R.A.S. Castro, V. Richter-Trummer, S.M.O. Tavares, P.M.G.P. Moreira, P. Vilaça, P.M.S.T. de Castro, 'Friction stir welding on T-joints: Residual stress evaluation'.
  - V. Richter-Trummer, P.M.G.P. Moreira, S.D. Pastrama, M.A.P. Vaz, P.M.S.T. de Castro. 'A hybrid experimental-numerical methodology for fracture mechanics analysis of cracked structures'.
- V. Richter-Trummer, P.M.G.P. Moreira, J. Ribeiro P.M.S.T. de Castro, 'The contour method for residual stress determination applied to an AA6082-T6 friction stir butt weld', ECRS 8 8th European Conference on Residual Stresses, Riva del Garda, Trento, Italy, **June 26-28, 2010**.
- S.M.O. Tavares, 'New design concepts for aeronautical products welded by friction stir', oral presentation, and poster, Sessão 2: Engenharia, Design e Processos Avançados de Manufatura, Ciência 2010 – Encontro com a Ciência e Tecnologia em Portugal, Lisboa, **July 5-7, 2010**.

#### Other communications

- P. M. S. T. de Castro, 'O(s) sector(es) da aeronáutica e do espaço: percepções de um universitário do Porto', Workshop POOL NET (CENTIMFE), **Évora, Oct. 15, 2009**.
- P. M. S. T. de Castro, 'Projectos de investigação envolvendo o processo FSW', presented at: Seminário Processos de Soldadura Emergentes: Friction Stir Welding', INEGI, **Porto, Oct. 26, 2009**.
- P.M.S.T. de Castro, presentation of objectives of FCT project Railways at IST, during visit of Prof. D. Socie (University of Illinois, USA), **Lisbon, April 14, 2010**.
- P.M.S.T. de Castro, 'Materials and railways: fatigue behaviour of rolling stock and infrastructure', Sessão12E: Transporte ferroviário: tecnologias e sistemas, Ciência 2010 – Encontro com a Ciência e Tecnologia em Portugal, **Lisbon, July 5-7, 2010**.
- P.M.S.T. de Castro, invited lecture, 'Fracture and fatigue of FSW Al joints: focus on Al-Li 2195', VI-IPSUS Summer School 2010, GKSS, **Hamburg-Bergedorf, Aug. 30-Sept. 3, 2010**.

#### Patents

- Decision: Patente em Portugal nº.103867 'Soldadura por fricção linear - soldaduras em T' ( UPIN Pat.27 ), **Boletim da Propriedade Industrial**, (233), 2009, **Nov. 30, 2009**, [www.inpi.pt](http://www.inpi.pt)

#### Project reports

- Final report, FCT project 'WELDING - Fiber Bragg grating sensors for modeling of friction stir welding (FSW) and laser beam welding (LBW)', contract FCT PTDC/EME-TME/66362/2006, Jan. 31, 2010, up-dated with **Measur. Sci. and Tech.** paper in July 1, 2010.

#### Conferences, meetings and short courses attended

- **Porto**, Portugal, First International Conference on Integration of Design, Engineering and Management for Innovation IDEMI'09, Porto, Portugal, **September 14-15, 2009**.
- **Amadora**, Portugal, Workshop Railway Maintenance Research, at EMEF, Railways Technology and Innovation Unit, **Oct. 1, 2009**.
- **Évora**, Portugal, Workshop POOL NET (CENTIMFE), **Oct. 15, 2009**.
- **Lisbon**, Portugal, Seminário Mobilidade, Câmara de Comércio e Indústria Luso-Francesa, **Nov. 18, 2009**.
- **Porto**, Portugal, CIFIE 2010 – Iberian Conference on Fracture and Structural Integrity, Porto, FEUP; **March 17-19, 2010**

- **Guimarães**, Portugal, CNME 2010 - 8º Congresso Nacional de Mecânica Experimental, APAET, Univ. Minho, **April 21-23, 2010**.
- **Lisbon**, Portugal, 'Materials and railways: fatigue behaviour of rolling stock and infrastructure', Sessão12E: Transporte ferroviário: tecnologias e sistemas, Ciência 2010 – Encontro com a Ciência e Tecnologia em Portugal, **July 5-7, 2010**.
- **Hamburg-Bergedorf**, Germany, 'Fracture and fatigue of FSW Al joints: focus on Al-Li 2195', VI-IPSUS Summer School 2010, GKSS, at the Ramada Hotel Hamburg-Bergedorf (invited lecture), **Aug. 30-Sept. 3, 2010**.

### Networks

- PMST de Castro, AA Fernandes, European Rail Research Network of Excellence EURNEX, since 2004.
- PMST de Castro, EASN - European Aeronautics Science Network, since 2005.

### Membership of editorial boards

- **Ciência e Tecnologia dos Materiais** (SPM), ISSN 0870-8312, founder and member of editorial board 1989-1991; editorial board member since 2010.
- **Fatigue and Fracture of Engineering Materials and Structures**, (J Wiley-Blackwell), ISSN 8756-758X, since 2001.
- **International Journal of Structural Integrity**, (EMERALD), ISSN 1757-9864, since 2008.
- **Mecânica Experimental** (APAET), ISSN 1646-7078, since issue #1, 1996.
- **Mechanika**, (Kaunas University of Technology), ISSN 1392-1207 6, since 2004.
- **UPB Scientific Bulletin, Series D: Mechanical Engineering**, (Universitatea Politehnica Bucuresti), ISSN 14542358, since 2008.

### Refereeing for journals, in 2009-2010

- *Composite Structures*,
- *Computational Materials Science*,
- *Engineering Fracture Mechanics*,
- *Fatigue and Fracture of Engineering Materials and Structures*,
- *Indian Journal of Engineering and Materials Sciences*,
- *International Journal of Fatigue*,
- *International Journal of Structural Integrity*,
- *Journal of Materials Processing Technology*,
- *Materials Science Forum*,
- *Measurement Science and Technology* (Institute of Physics UK), with the collaboration of V Richter-Trummer,
- *Mecânica Experimental*,
- *Proceedings of the Institution of Mechanical Engineers, Part B, Journal of Engineering Manufacture*,
- *Strain*,
- *Structural Engineering and Mechanics, an International Journal*.

### Organization of events

- Iberian Conference on Fracture and Structural Integrity CIFIE'2010, Porto **17-19 March 2010, P. M. S. T. de Castro, chair**.
- 1st International Conference of the Journal of Structural Integrity IJSI'2012, Porto, FEUP, 25-28 June 2012, **P. M. S. T. de Castro, chair**.



1st International Conference of the  
International Journal of Structural Integrity

25-28 June 2012, Porto, Portugal

### Scientific committees of conferences (invitations accepted)

- 12th International Congress on Mesomechanics, National Taiwan University of Science and Technology, Taipei, Taiwan, **June 21-25, 2010**, (member of the International Scientific Committee).
- 2nd International Conference of Engineering against Fracture ICEAF II, Patras, Greece, **June 22-24, 2011** (member of the Scientific Committee).
- 13th International Congress on Mesomechanics, University of Padova, Vicenza, Italy, July 2011 (member of scientific committee)
- VI International Materials Symposium MATERIALS 2011 - XV meeting of SPM - Sociedade Portuguesa de Materiais, Guimarães, Portugal, **April 18-20, 2011**
- 5th International Conference on Advanced Computational Engineering and Experimenting, ACE-X 2011, Algarve, Portugal, **July 3-6, 2011** (member of scientific committee)

### Investment in equipment

- Maintenance and re-calibration of the 100kN capacity MTS and 250 kN capacity MTS servo-hydraulic machines of LET-FEUP and IDMEC, paid for by project FCT PTDC/EME-TME/66362/2006 (**50%**) and projects of P. P. Camanho (**50%**).
- Up-grade and repair of hydraulic pump of 250 kN MTS, **100%** paid for by project FCT PTDC/EME-TME/66362/2006.
- Two travelling microscopes, for the existing 100kN servo-hydraulic testing machine, designed by V. Richter-Trummer and partially manufactured at the DEMec-FEUP / INEGI workshop; costs covered by FCT project PTDC/EME-PME/100204/2008.
- Workstation INTEL XEON 8 cores and 16 GB RAM for scientific computation; acquired through FCT project PTDC/EME-PME/100204/2008.

### Visitors

Among many others, the following visitors were welcomed at FEUP:

- Susana Moretto, ALSTOM Transport, High Speed Market Developer, Portugal, **21 Sept. 21 and Sept. 30, 2009**
- Daniel Cadet, ALSTOM Transport, France, **Sept. 30, 2009**
- Tapio Kalevi Yli-Viikari, Vice-Dean, Taideteollinen korkeakoulu – Taik (University of Art and Design Helsinki), Finland, **Nov. 13, 2009**
- Claudemiro Bolfarini, UFSCar, Brasil, **Jan. 22, 2010**
- Wieslaw Ostachowicz, Polish Academy of Sciences, Gdansk, Poland, **Feb. 3, 2010**
- Emilio Garcia Garcia, TALGO, Madrid, Spain, **April 12, 2010**
- João Constantino Meireles, TALGO, Madrid, Spain, **April 12, 2010**

### Current duties at FEUP, in the period

- Director of PRODEM, Mechanical Engineering Doctoral Programme of FEUP.

### Acknowledgments

Students and colleagues at FEUP and elsewhere that contributed to - or indeed performed the bulk - of the actions listed. Financing organizations.

Porto, December 5, 2010

*Paulo M S Tavares de Castro*