Research Proposal Presentation

Development of measurement techniques of stress-strain state of lifting machinery components

Centro Interdipartimentale di Studi e Attività Spaziali «G. Colombo»

Scuola di Dottorato in Scienze Tecnologie e Misure Spaziali (STMS) CICLO XXXIII

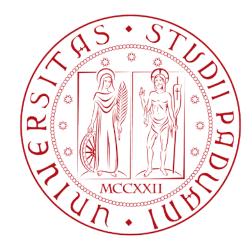
Curriculum: Misure Meccaniche per l'Ingegneria e lo Spazio (MMIS)

LORENZO CAPPONI

PHD STUDENT MATR. 1173679

Tutor: Prof. Gianluca Rossi







Development of measurement techniques for stress-strain state of lifting machinery components







PhD Student: Lorenzo Capponi

Overview of the presentation

- Objectives of the research
- Collaboration with the Industry
- Issues related to lifting machinery
- Standard measurement methods e development
- Summary of three-years doctoral research activity

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Main objective:

Development of measurement techniques of stressstrain state of lifting machinery components

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Intermediate objectives:



Innovative measurement chain

Innovative data acquisition and management software

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Number of emploees: 22 000 Revenue: 7.3 billion (US\$)



President: Matthew Fearon







Senior Director Umbertide: Francesco Aiello

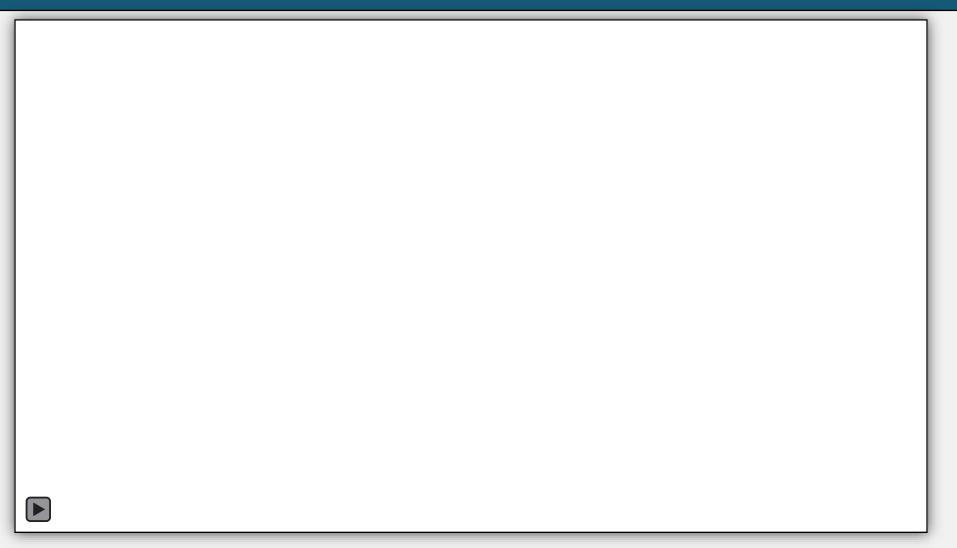
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United States Australia Brazil China France Germany Italy Japan Netherlands Russia Singapore South Korea Spain Sweden **United Arab Emirates** United Kingdom

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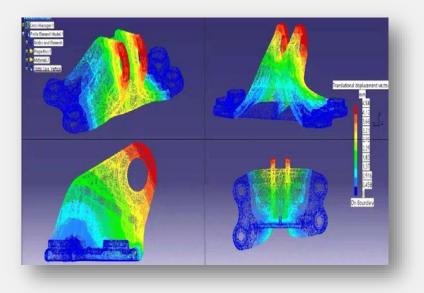




MATTER OF INTEREST



Vibrations



Stress-Strain State

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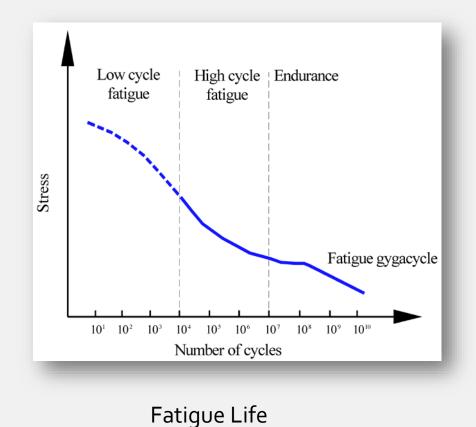
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MAIN ISSUES





Comfort and noise analysis

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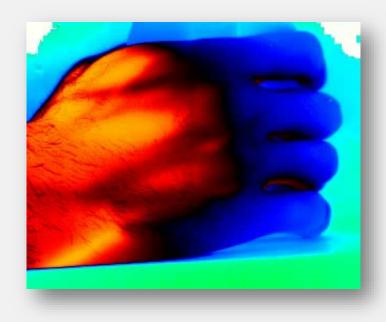






Thermoelastic Stress Analysis

$$\Delta T = \frac{-\alpha T}{\rho C_p} \ (\Delta \sigma_x + \Delta \sigma_y)$$



- α = Thermal expansion coefficient
- C_p = Specific heat
- ρ = Density
- T = Absolute Temperature
- $\Delta \sigma_{i,j}$ = Variation of surface tension in two orthogonal directions lying on the surface

Hypothesis:

- Isotropic, homogeneous and linear elastic behavior
- Adiabatic processes

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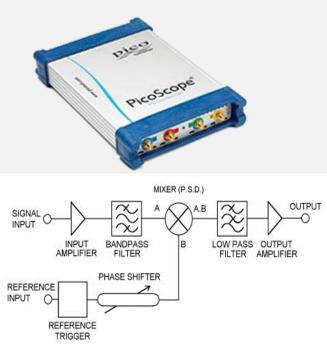




Thermoelastic Stress Analysis



Thermal Camera



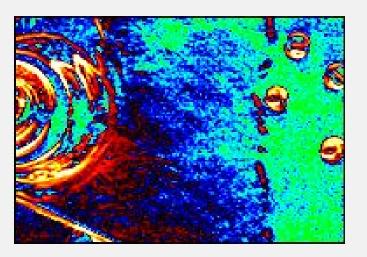


Image Analysis

Signal-Processing: Lock-in Amplifier

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GOM Metrology System



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DEVELOPMENT

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PRELIMINARY STEP	 DEPTH STUDY OF THEORY ANALYSIS OF LIFTING MACHINERY APPLICATION OF STANDARD METHODS
DEVELOPMENT	 INNOVATION OF TEST BENCH MEASURING DOCTORAL COURSES, SEMINARS, CONFERENCE, EXPERIENCE ABROAD
RESULTS	 DATA ACQUIRED ANALYSIS WORKING ON RESULTS WRITING THESIS

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Genie GTH-1056





Grazie per l'attenzione