

## Abstract

The habilitation thesis "*Innovative techniques for welding process utilization and control*" summarizes the research and academic activities in the field of industrial engineering carried out by the author of this thesis in the period 2013-2024, after the public defense on 03.10.2013 of the PhD thesis entitled "*Rehabilitation of historic steel bridges with cantilevers and Gerber hinges*".

The paper is structured in three main parts. The first part is a synthesis of the author's scientific, academic and professional works, in the second section the author's researches are presented, and in the third section the author's career evolution and development strategies are presented.

The first part of the habilitation thesis (Chapter 1) mentions the main scientific, academic and professional achievements of the author, obtained in the last 11 years since the public defense of the PhD thesis. The research carried out during these years can be grouped in four main directions:

- steel structures (Analysis of Failure Mechanics and optimization of tests on welded joints)
- welding processes and dissimilar joints
- stress and strain control
- Safety and Health at Work (SSM)

In addition to these areas, more research can be added in: quality management and control, related welding processes, virtual reality in industrial engineering, ergonomics, etc. The results of the research are presented in scientific articles (124 articles - <https://www.researchgate.net/profile/Anamaria-Feier> ), published books (9 books and 4 book chapters in international publishing houses), research contracts (more than 20 in which the author was involved). From the point of view of academic achievements, a brief description of the author's teaching and training activities, as well as her functions and responsibilities at the departmental level are presented. The professional prestige of the author of the thesis is validated by the books published, the results of research contracts and scientific papers published (34 indexed in ISI Web of Science, 16 published in journals, 3 in journals in the red zone -Q1). Related to professional prestige can be added the membership of national and international professional organizations, journals reviewer, national and international conferences, awards and diplomas obtained.

The published scientific papers can be found on specialized websites and in international databases such as Web of Science, Scopus, Googler Scholar, Copernicus, etc.

The Hirsch indices in Web of Science, Scopus, Googler Scholar are as follows:

- Hirsch from Web of Science - H-Index = 4 (62 citations)
- Hirsch from Scopus - h-index = 4 (81 citations)
- Hirsch from Googler Scholar - h-index = 8 (222 citations)

**Chapter 2.1** presents aspects related to the behavior of steel structures (analyses of Fracture Mechanics - "Living with defects" - and Optimization of laboratory tests in the field of CCIA),

respective research in the field of fracture mechanics of steel structures and optimization of laboratory tests taking into account the influence of the temperature factor.

The conclusions of this research direction are reproduced below; detailed analyses using Fracture Mechanics demonstrate that the existence of possible and probable small cracks (of  $\approx 2$  mm), lead to a service life - under normal operating conditions - for the eye bar (the main resistance element in Gerber structures / cantilever and hinged beams), reduced to less than 1 year, which indicates that according to the standards that the element is not safe in service and may lead to the failure of the whole structure!

The second topic addressed concerns research related to the optimization of laboratory tests. A very important factor was the low operating temperature (-40 C), studying the influence of this factor on the physico-mechanical characteristics of steel reinforcement specimens.

The results of this research direction have been valorized through the publication, as author/co-author, of a number of 32 articles in specialized journals and in the volumes of international and national conferences and 2 PNII phase reports.

**Chapter 2.2** Research in the field of welding processes and dissimilar joints started in 2014 after the end of my PhD thesis. My scientific interests have focused on both welding processes and dissimilar joints. I realized for the first time in the Materials and Manufacturing Engineering department a dissimilar joint obtained by Friction Riveting (Polyetherimide (PEI) joint with an Aluminum rivet). Another innovation in the department of Materials and Manufacturing Engineering was the use of the WAAM (Wire Arc Additive Manufacturing) process.

According to the research conducted in this direction, more than 15 publications valorized at different conferences and published in different journals indexed in international databases or even Q1 red zone (e.g. Materials - articles one of which has over 3500 views and citations in ISI web of science).

**Chapter 2.3.** Research in the field of stress and strain control, this direction has been started in 2017 by addressing this topic in some case studies whose results were valorized through conference papers. The theme has materialized in several actions starting in 2019 with the introduction for the first time at the Faculty of Mechanics of Timisoara in the Master of Welding Processes in Protective Active Gas Environment, the course of "Control of residual stresses and strains in welding", the course that I have been teaching for the last 5 years.

Results of this research direction are valorized in more than 10 papers at conferences and in different journals (e. g. Metallography, Microstructure, and Analysis - SPRINGER NATURE) as well as a book published in 2024, Book Editura Politehnica - Anamaria Feier, Richard Molnar, Edward Petzek. "Deformation repair of welded joints. Practical applications", ISSN :978-606-35-0582-9.

**Chapter 2.4.** Research in the field of occupational health and safety, this research direction has generated over the last 5 years more than 10 publications, one of which in the red zone in the journal Int. J. Environ. Res. Public Health, a journal with an impact factor of 4.614. The results of the studies represent an important input for establishing preventive and protective measures for the analyzed workplaces in correlation with measures addressing other specific risks and could also serve as a model for their extension and application to other similar workplaces in future studies.

**Chapter 3** presents the plan for career evolution and development, a great emphasis I will put in the future on attracting reputed specialists with international recognition for organizing teaching activities and engaging in international projects -Sorin Keller (IIW - Switzerland), Lucian Blaga (Heron -Germany), Sergia T. Amancio (TU- Graz), Damjan Klobčar (Lubiana - Slovenia), Lucian Attila Blaga (Germany).

The habilitation thesis concludes with the list of bibliographical references associated with the three parts presented in chapters 1, 2 and 3.