STRUBECON

Assessment of Structural Behaviour in Limit State Operating Conditions

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No. 6876

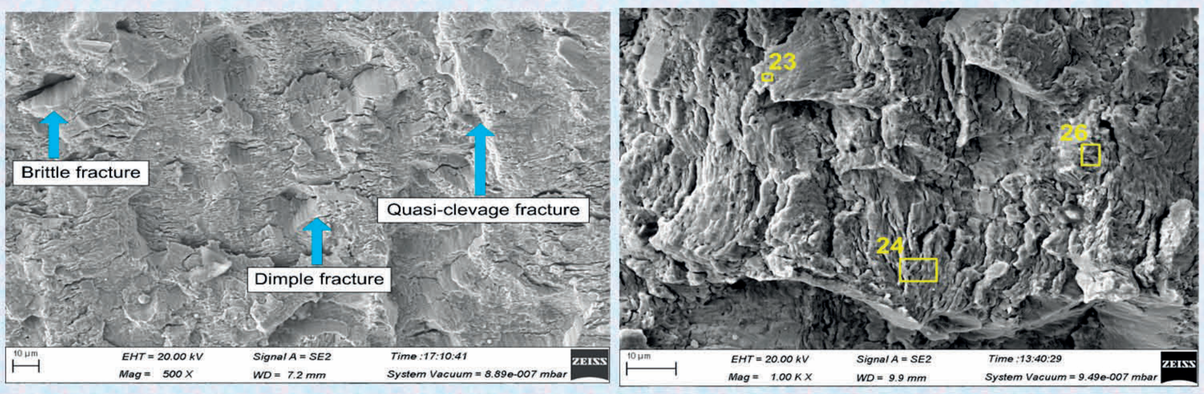
The Project

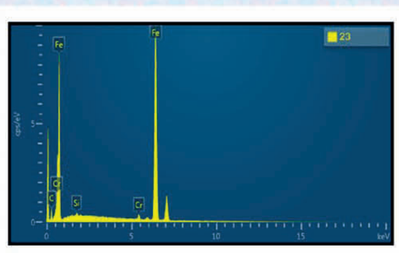
- The project aims to describe the structures operating in limit state conditions. The studies are performed by experimental and numerical research methods. Therefore, the main objective is to provide an assessment of structure behaviour, by comparing of the parameters such as stress, strain, crack occurrence, etc., caused by certain load level and temperature at this unexpected limit state with those allowed by material properties. The following research sub-objectives should be accomplished: testing of material properties; impact energy; the determination of the crack driving force and life assessment of structural elements; evaluation of the semi-rigid structural joints/connections behaviour; buckling simulations of composite beam-type structures; proper constitutive modelling at limit operating conditions, etc. Although many journal papers were published, only some of them are mentioned here.

- Research group: Prof. Josip Brnić, D. Sc. (Principal investigator) — Prof. Goran Turkalj, D. Sc. — Prof. Marko Čanađija, D. Sc. — Prof. Domagoj Lanc, — Assoc. Prof. Goran Vukelić, D. Sc. — Assist. Prof. Marino Brčić, D. Sc.— Assist. Prof. Igor Pešić, D. Sc. — Assist. Prof. Sanjin Kršćanski, D. Sc. — Neven Munjas, D. Sc. — Damjan Banić, D. Sc. stud. — Sandra Kvaternik, D. Sc. cand. — Edin Merdanović, D. Sc. cand.

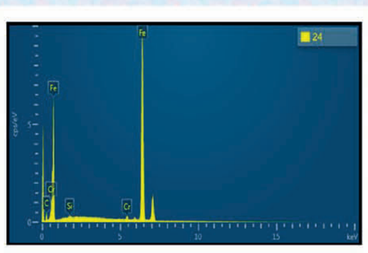
Outcomes

SEM and EDS analysis: 51CrV4 steel under uniaxial (sinusoidal) fatigue

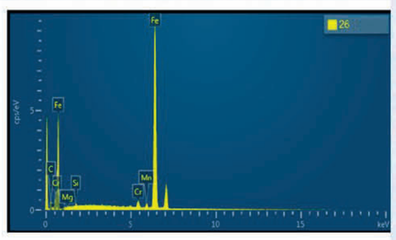




Element	wt %
C	10.53
Si	0.23
Cr	1.13
Rest	88.11

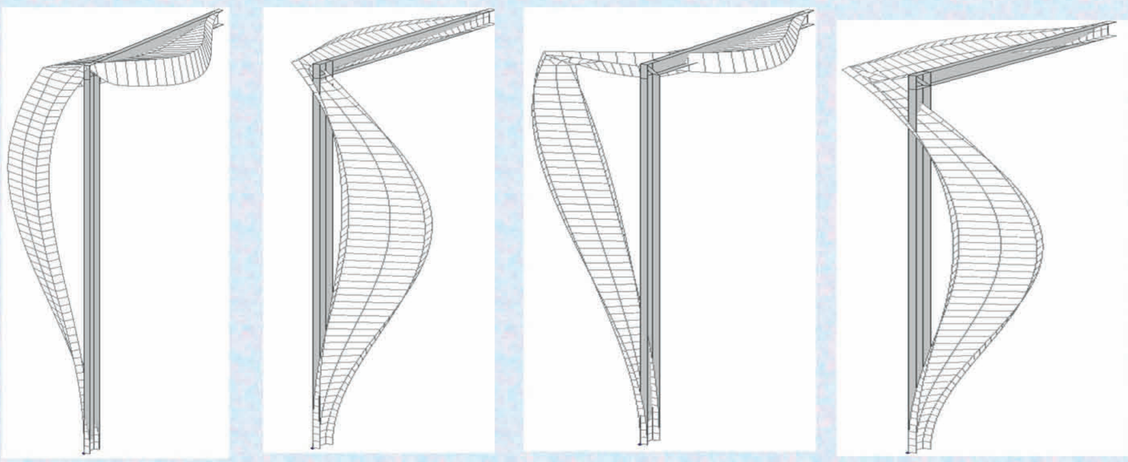


Element	wt %
C	7.60
Si	0.16
Cr	1.03
Rest	91.21



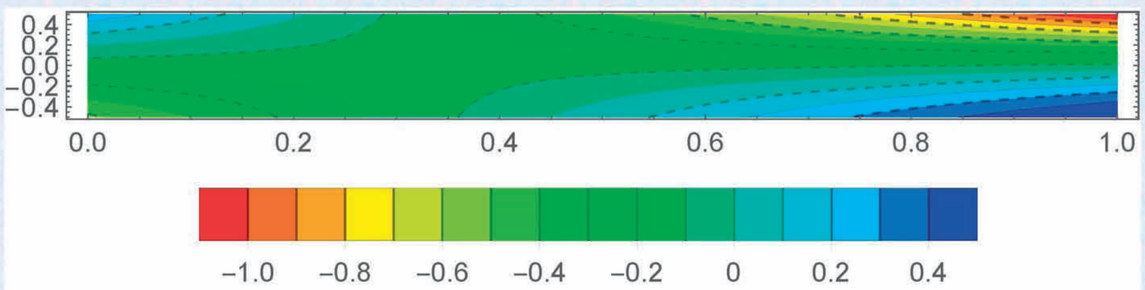
Element	wt %
C	7.37
Mg	0.10
Si	0.36
Cr	1.72
Mn	1.48
Rest	88.97

Channel section L-frame buckling



a) mitre joint; b) box joint; c) stiffened mitre joint; d) box mitre joint

Nonuniform heating of a doubly clamped beam



Distribution of the normal stress σ along the doubly clamped beam loaded with the non-uniform temperature

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4. Munjas, N., Čanađija, M., Brnić, J.: Thermo-Mechanical Multiscale Modeling in Plasticity of Metals Using Small Strain Theory. Journal of Mechanics

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6. Kvaternik, Sandra; Turkalj, Goran; Lanc, Domagoj, Analysis of flexure, torsion and buckling of thin-walled frames with a focus on the joint warping behaviour. Transactions of FAMENA
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8. Brnić, Josip; Kršćanski, Sanjin; Lanc, Domagoj; Brčić, Marino; Turkalj, Goran; Čanađija, Marko; Niu, Jitai, Analysis of the Mechanical Behavior, Creep Resistance and Uniaxial Fatigue Strength of Martensitic Steel X46Cr13. Materials
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12. Vukelić, Brnić, Numerically Predicted J-integral as a Measure of Crack Driving force for Steels 1.7147 and 1.4762. Journal of Theoretical and Applied Mechanics

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17. Čanađija, Barretta, Marotti De Sciarra, A gradient elasticity model of Bernoulli-Euler nanobeams in non-isothermal environments, European Journal of Mechanics, A/Solids
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19. Čanađija, Munjas, Brnić, A multiscale approach to thermoplastic deformation, Proceedings in Applied Mathematics and Mechanics
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21. Lanc, Turkalj, Vo, Brnić, Nonlinear buckling behaviours of thin-walled functionally graded open section beams, Composite Structures
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38. Brnić, Turkalj, Lanc, Čanađija, Brčić, Vukelić, Comparison of material properties: Steel 20MnCr5 and similar steels. Journal of Constructional Steel Research
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http://www.riteh.uniri.hr/media/filer_public/2d/42/2d42c803-b3fd-43c2-8567-a202fc1fe79e/strubecon_web.pdf

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