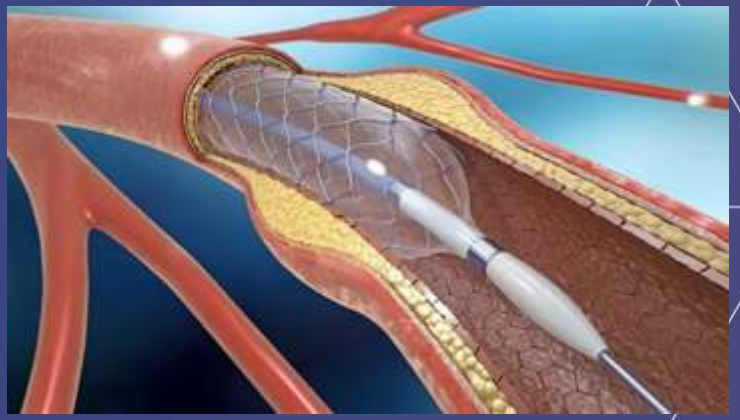

Index of research topics and projetcs IMT – Mechanical Engineering

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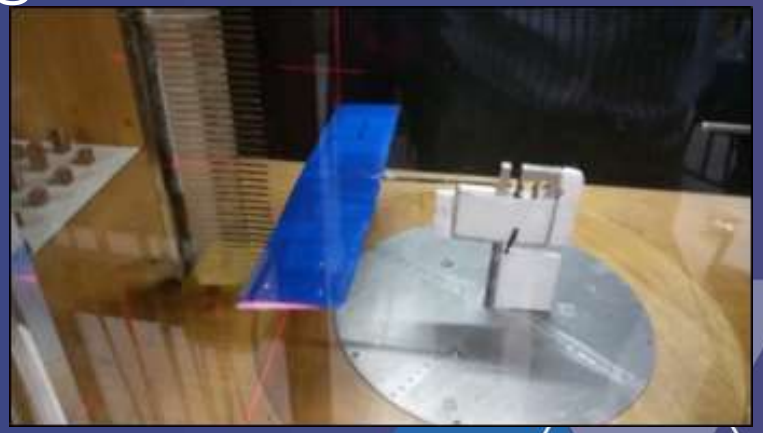
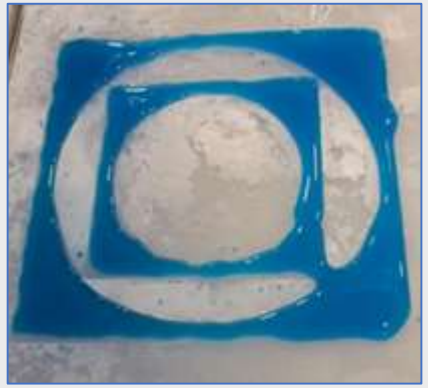
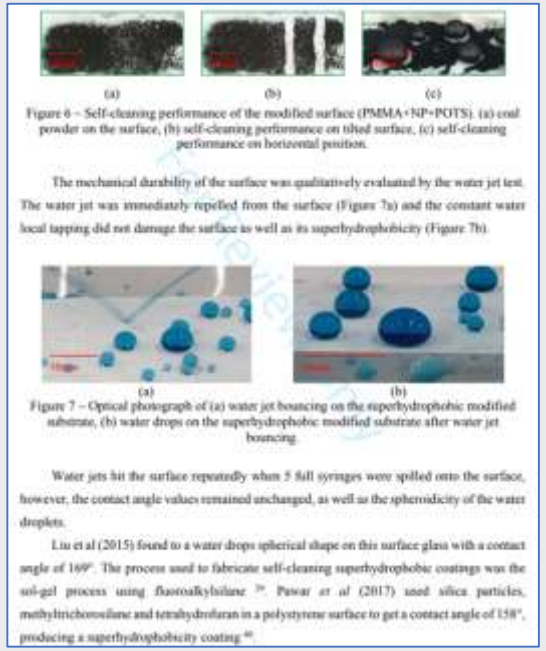


Materials Science & Engineering

- Superhydrophobic surfaces





(a) (b) (c)

Figure 6 – Self-cleaning performance of the modified surface (PMMA+NP+POTS). (a) coal powder on the surface, (b) self-cleaning performance on tilted surface, (c) self-cleaning performance on horizontal position.

The mechanical durability of the surface was qualitatively evaluated by the water jet test. The water jet was immediately repelled from the surface (Figure 7a) and the constant water local tapping did not damage the surface as well as its superhydrophobicity (Figure 7b).

(a) (b)

Figure 7 – Optical photograph of (a) water jet bouncing on the superhydrophobic modified substrate, (b) water drops on the superhydrophobic modified substrate after water jet bouncing.

Water jets hit the surface repeatedly when 5 full syringes were spilled onto the surface, however, the contact angle values remained unchanged, as well as the sphericidicity of the water droplets.

Liu et al (2015) found to a water drops spherical shape on this surface glass with a contact angle of 169°. The process used to fabricate self-cleaning superhydrophobic coatings was the sol-gel process using *fluoroalkylsilane* [39]. Pawar *et al* (2017) used silica particles, methyltrichorosilane and tetrahydrofuran in a polystyrene surface to get a contact angle of 158°, producing a superhydrophobicity coating [40].

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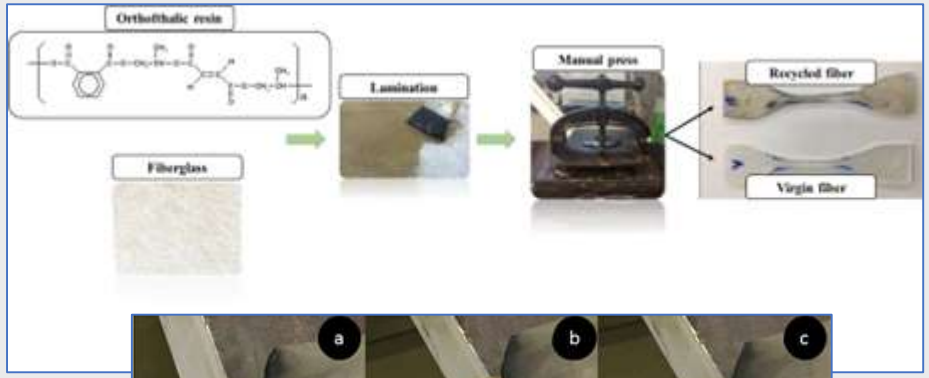
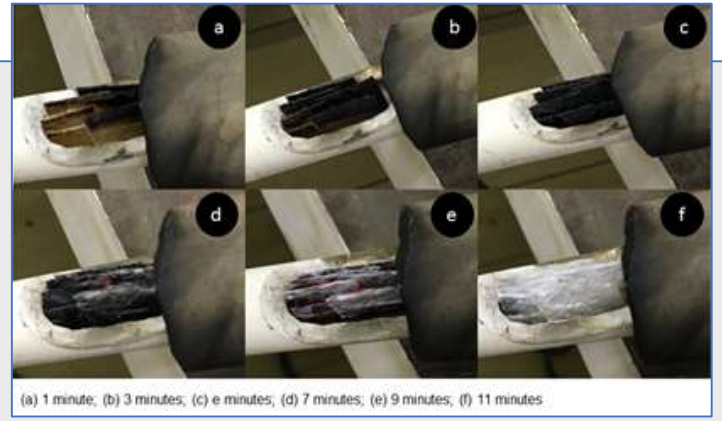
Dr. Susana Lebrão

- Composites Recycling and Graphene research



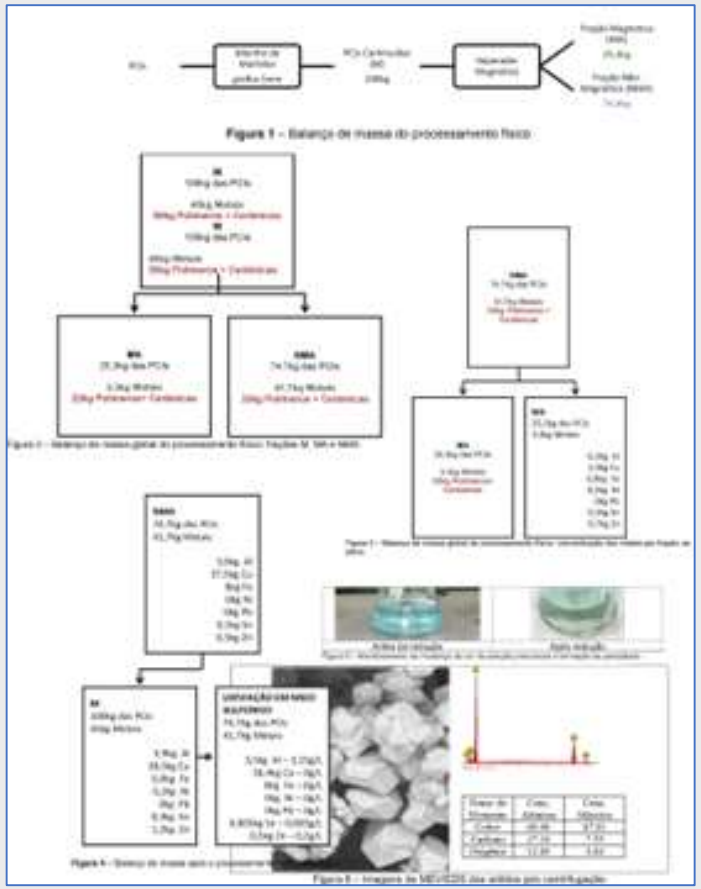


(a) 1 minute; (b) 3 minutes; (c) e minutes; (d) 7 minutes; (e) 9 minutes; (f) 11 minutes

Dr. Guilherme Lebrão

Materials Science & Engineering

- Electronic Equipment Recycling Research



Group Research Directory at CNPq:
dgp.cnpq.br/dgp/espelhogrupo/9142594101348614

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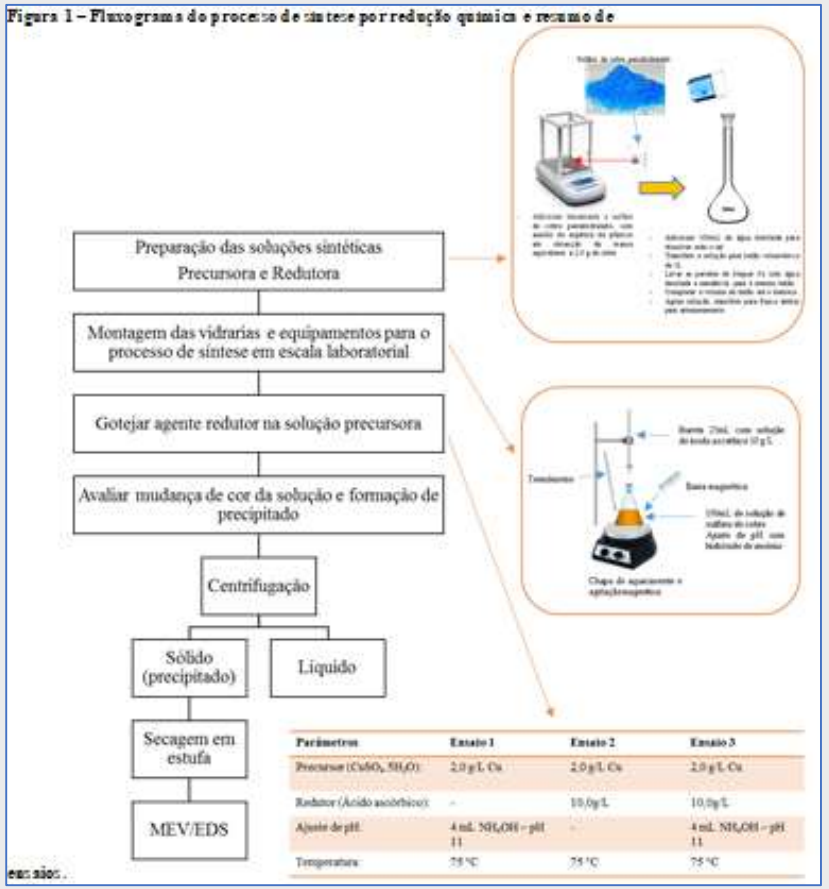

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Mechanical Design & Manufacturing Processes

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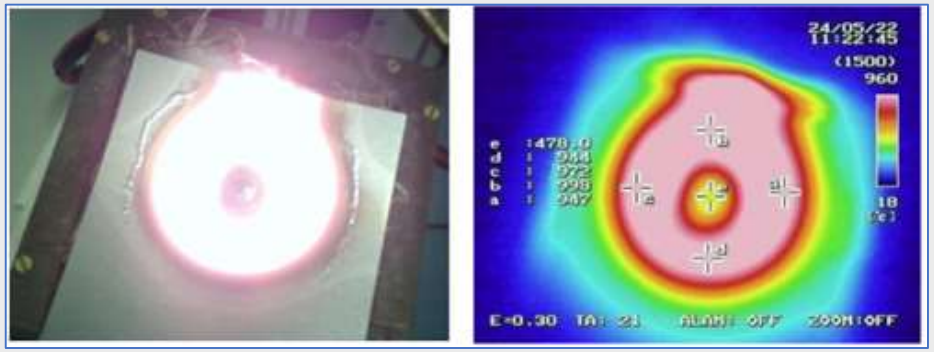
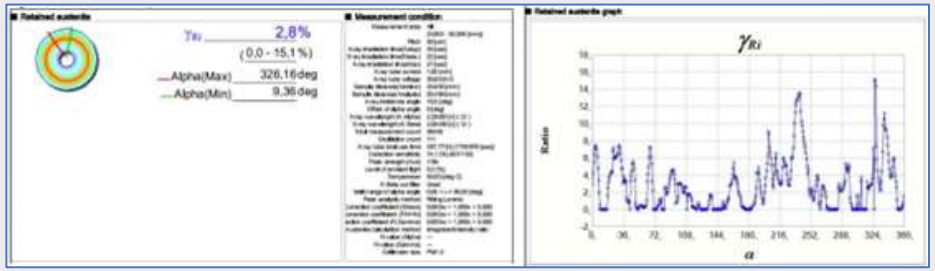
PHS – Press hardened steel process

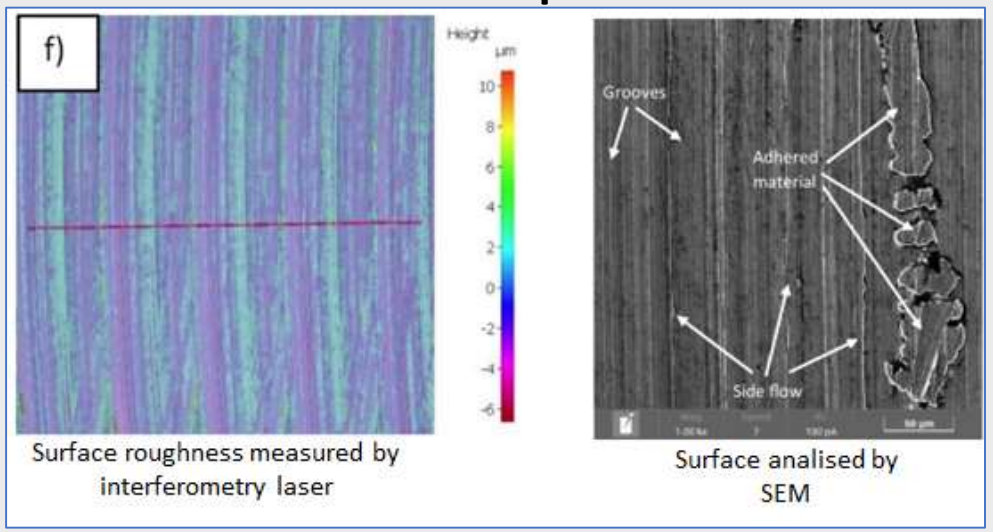


Practical application: sheet metal structural parts, mainly in the automotive industry



Retained austenite test

Influence of cooling systems (cryogenic, MQL, nanofluids) on the surface integrity of machined parts



Surface roughness measured by interferometry laser

Surface analised by SEM

Practical application: improvements in surface quality and service life of manufactured parts

PUBLISHED PAPER: Bordinassi, Ed Claudio; SERIACOPI, VANESSA ; DOS SANTOS, MARCELO OTÁVIO ; PASCHOALINOTO, NELSON WILSON ; DE FARIAS, ADALTO . Effect of cryogenic cooling on residual stresses and surface finish of 316L during hybrid manufacturing. INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY (INTERNET), v. 129, p. 1489-1502, 2023.

Dr. Ed Claudio Bordinassi/ Dra Vanessa Seriacopi/ Dr. Adalto de Farias / Dr. Nelson Pascoalinoto / Dr. Marcelo Otávio

Mechanical Design & Manufacturing Processes

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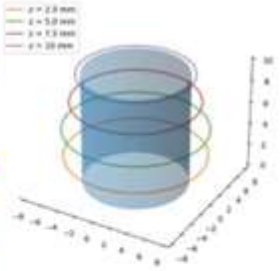
Additive manufacturing (experimental and simulation / residual stresses / thermal distortions)

z = 2,5 [mm]	RESIDUAL STRESS [MPa]
1	195,52
2	205,30
3	215,58
4	216,91
5	217,11

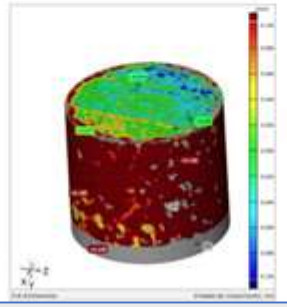
z = 5,0 [mm]	RESIDUAL STRESS [MPa]
1	212,27
2	214,06
3	231,94
4	213,07
5	232,01

z = 7,5 [mm]	RESIDUAL STRESS [MPa]
1	157,11
2	146,43
3	154,05
4	161,14
5	158,57

z = 10 [mm]	RESIDUAL STRESS [MPa]
1	109,62
2	109,09
3	106,77
4	103,10
5	96,77



Residual stress results

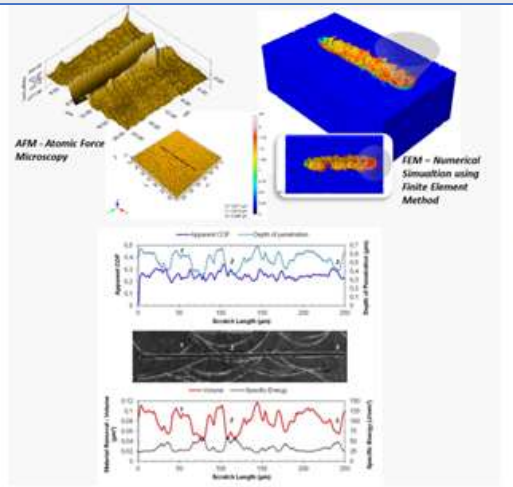


Thermal distortions results

EXAMPLE OF PUBLISHED PAPER: MIRANDA, F. ; DOS SANTOS, M.O. ; RODRIGUES, D. ; COELHO, R.S. ; BATALHA, G.F. . Ni based tungsten heavy alloy processed by PBF-L additive manufacturing and conventional LPS routes. MATERIALS TODAY: PROCEEDINGS, v. 1, p. 1, 2023.

Practical application: study of products with optimized geometry, parts for implants and prostheses

Tribology applied to scratch tests onto additive manufacturing materials



Microstructural, mechanical and topography characterizations related to scratch tests: friction coefficient and specific energy resulting from these features

PUBLISHED PAPER: BRIONES, FRANCISCO ; SERIACOPI, VANESSA ; MARTÍNEZ, CAROLA ; VALIN, JOSÉ LUIS ; CENTENO, DANY ; MACHADO, IZABEL . The effects of pressure and pressure routes on the microstructural evolution and mechanical properties of sintered copper via SPS. Journal of Materials Research and Technology-JMR&T, v. 25, p. 2455-2470, 2023.

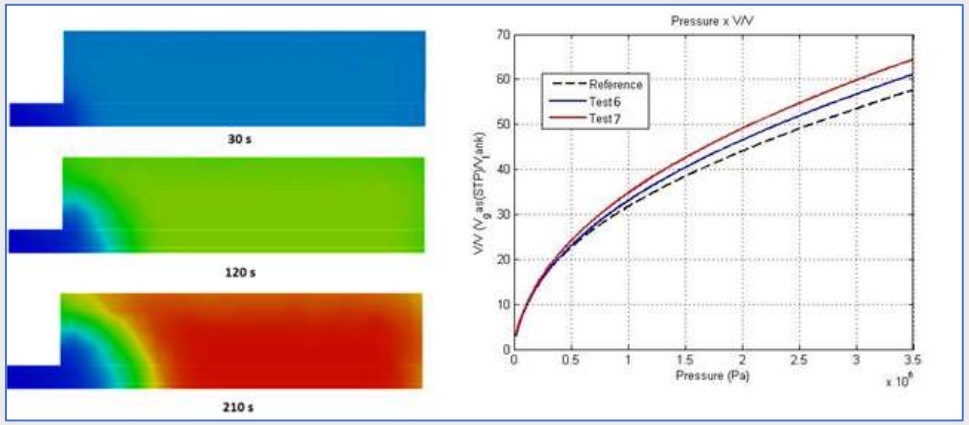
Practical application: tribological performance of materials during manufacturing process with material removal and abrasion (e.g. Ti alloys and stainless steels)

Dr. Ed Claudio Bordinassi/ Dr. Vanessa Seriacopi/ Dr. Adalto de Farias / Dr. Nelson Pascoalinoto / Dr. Marcelo Otávio

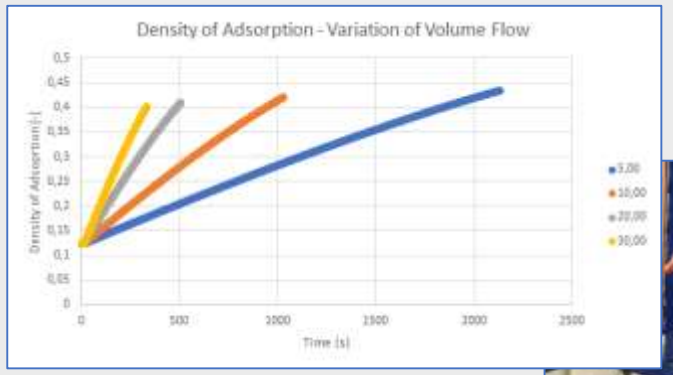
Energy and Fluids Group

Carbon Capture and Storage (CCS)

- Natural gas adsorption – Activated carbon x CNG/LNG
- Theoretical and numerical studies – CFD
- Conclusions: suitable technology for small amounts of gas



- New research: extension of the technology for CCS purposes
- Comparison between material performances: activated carbon x ZIF8
- Promising results and beginning of experimental tests



Dr. João de Sá Brasil Lima / Dr. Bruno Galelli Chieregatti

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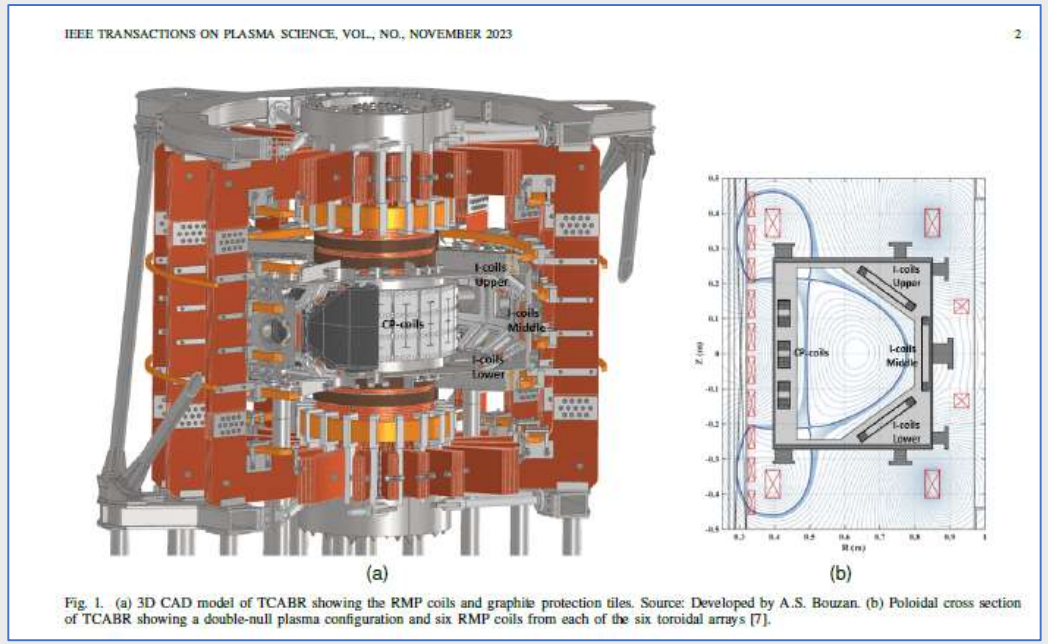
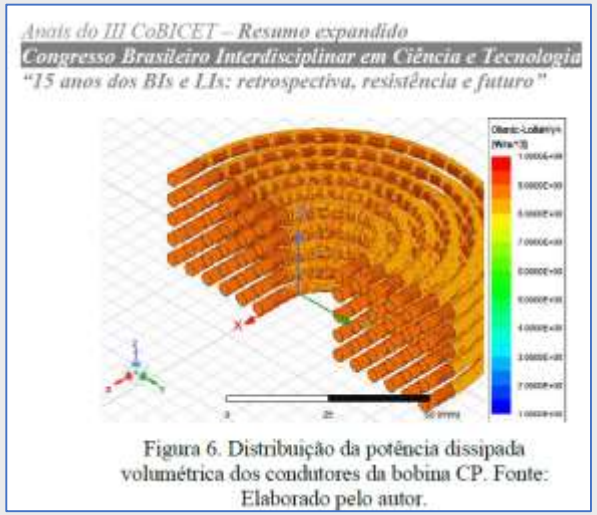
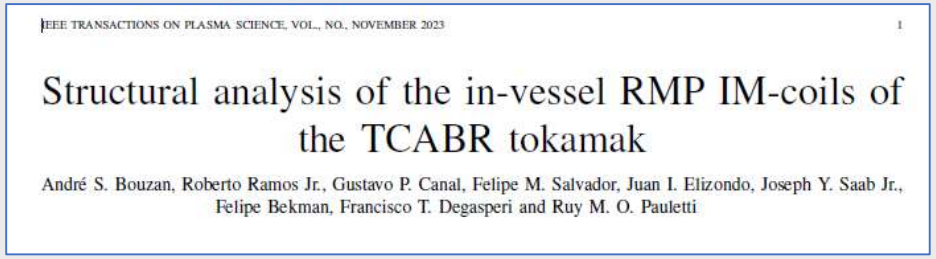
Energy and Fluids Group - Projects

- IF-USP Tokamak Fusion Reactor Mechanical and Thermal behavior research







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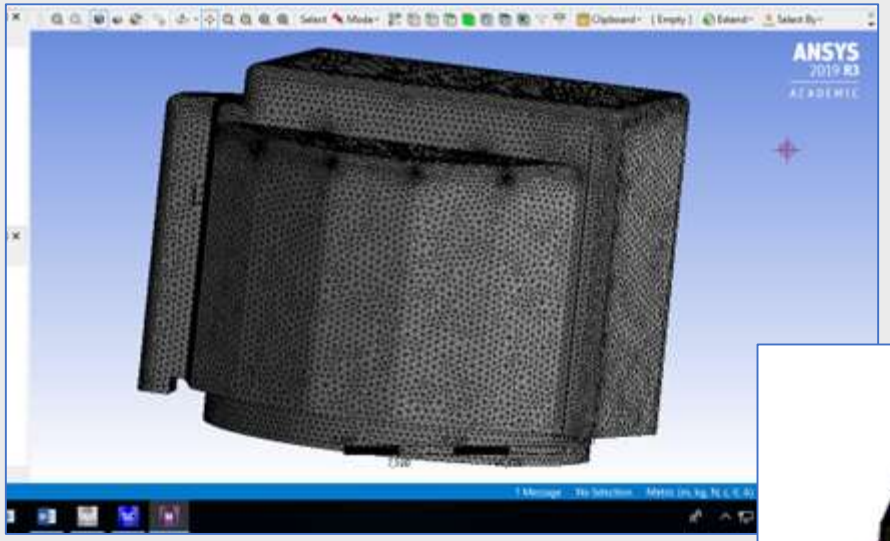
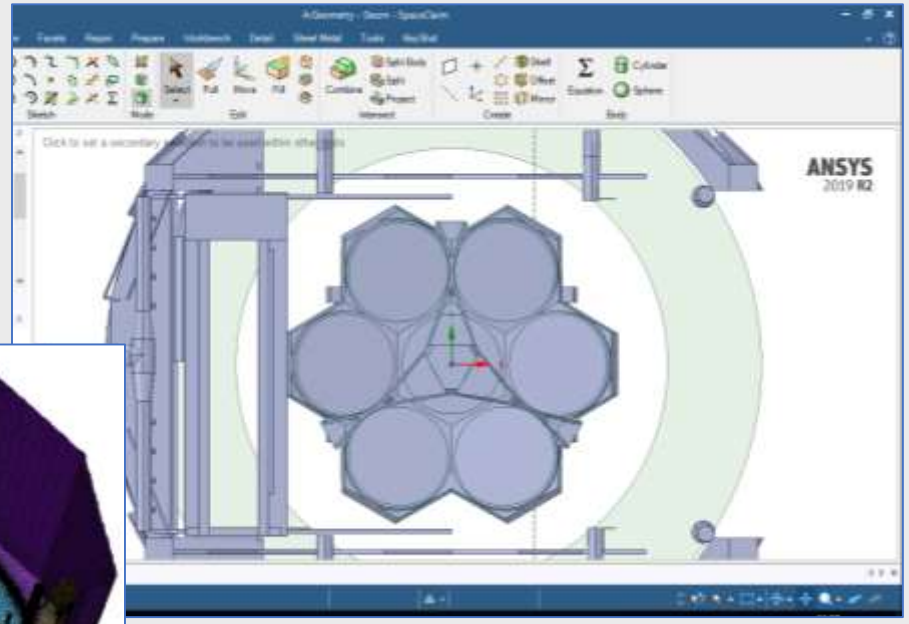
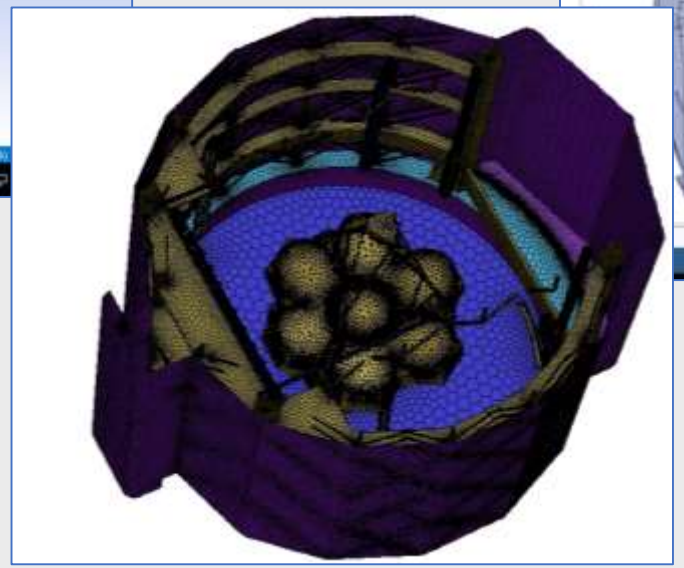
Energy and Fluids Group - Projects

- Giant Magellan Telescope – CFD Simulation





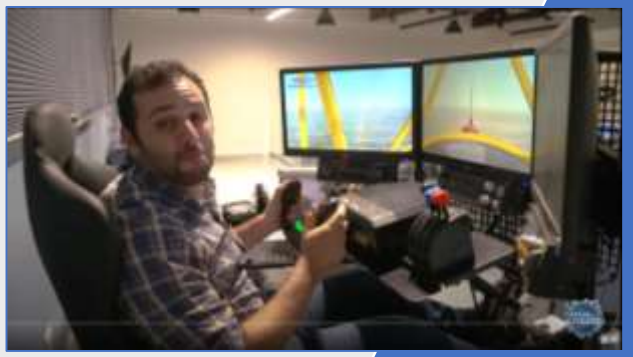


- GMT Enclosure temperature gradient simulation.
- 80 Million elements

Energy and Fluids Group - Projects

- IMT- Boeing Aeronautics Systems Integration Lab

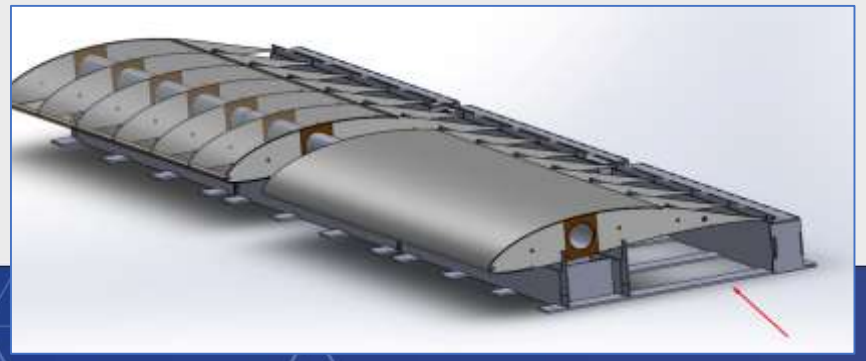
1. Flight Control Systems (pitch, roll, yaw e stab trim). Modos: mecânico, eletromecânico e fly-by-wire.
2. Landing Gear.
3. Electrical.
4. Navigation (air data computer, INS, Pitot).
5. Avionics.
6. Fuel System.
7. A/C and Pressurization.



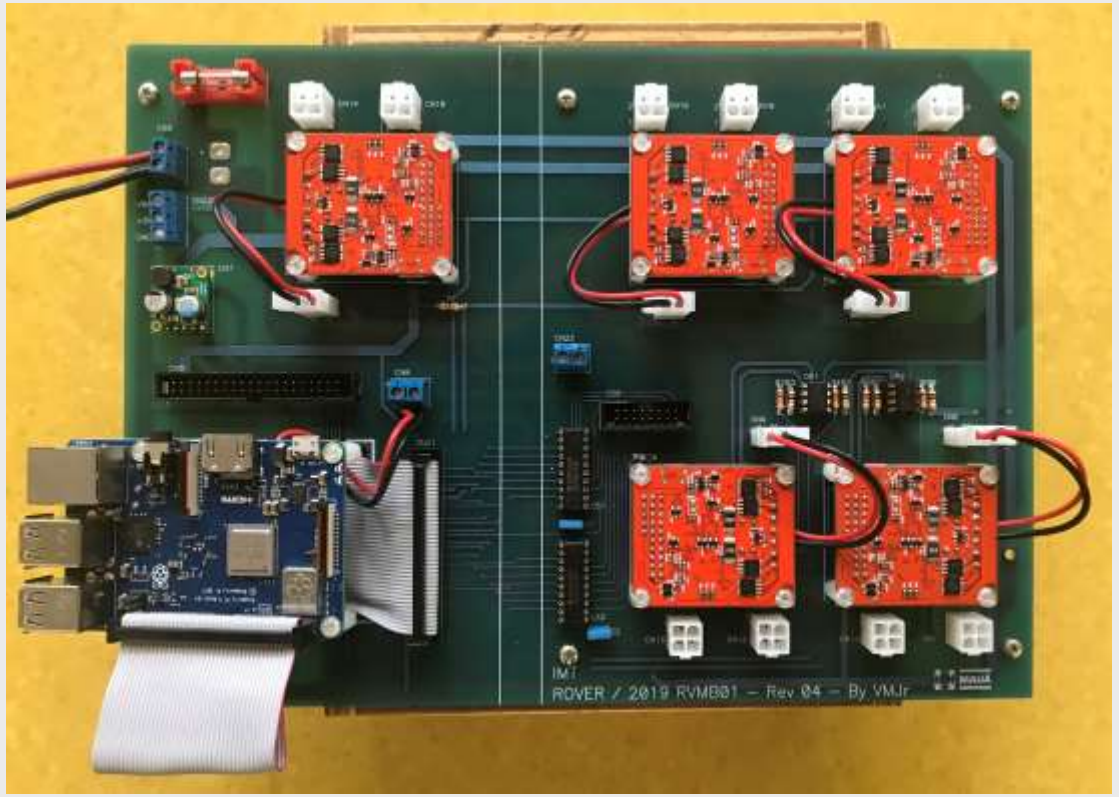
- Mechanical Control
- Software Control (Fluid Sim-> LPC)
- Flight Sim Integration
- Flight Sim + Flight Control Laws

Energy and Fluids Group – Student Projects

- Human-Powered Aircraft



- Nasa Open Source Rover



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Energy and Fluids Group – Student Projects

- SAE Aerodesign

- Space M

Energy and Fluids Group – Student Projects

- SAE FSAE

- SAE Baja

Energy and Fluids Group – Student Projects

- SAE F H2

- Shell Eco Marathon

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Automotive Group	Dr. Fernando Malvezzi	fernando.malvezzi@maua.br

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