virtualmech

virtual engineering. real results

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Technology developers

Technology & Services

- *State-of-the-art Computational Mechanics applied to your CSP needs.*
- *Coupled field Multiphysics fluid-thermal-mechanical simulations.*
- *Computational Fluid Dynamics (CFD) techniques for fluid dynamics/thermal problems: solar radiation to thermal energy conversion.*
- *Finite Element Method (FEM) for simulation of thermo-mechanical problems: thermal stress.*
- *Total design: analysis, optimization, evaluation; based on simulation tools.*
- *Simulation of transient phenomena: start-ups, shut-downs, clouds.*
- *Technology forecasting.*
- *Technical consultancy.*
- *Conceptual design of CSP components.*
- *Basic and detailed engineering of CSP components and systems. Certification under international code standards.*
- *Independent Engineering.*
- *O&M improvements and cost-cutting based on simulation, analysis and redesign or replacement of components and systems. Plant modernization.*
- *Root Cause Analysis (RCA), inverse and forensic engineering.*
- *Curves of parametric behavior for CSP components for integration in performance and marketing/bankability analysis tools for plants.*

About us

Virtualmech is an engineering company with extensive know-how in Computational Mechanics and Experimental Validation applied to simulation, analysis and design of Mechanical Systems, Structures and Foundations as well as Multiphysics coupled-field fluid-thermal-mechanical problems like CSP point and line focusing receivers, solar steam generators or TES tanks. Simulation-based design allows system optimization, scalability and the means to certify products under international standards. Root Cause Analysis (RCA) is also available within our simulation framework in order to improve existing designs or predict O&M problems with already installed equipment.

We provide the same technological solutions as research centers at competitive cost and at a faster time frame. Our team consists of simulation and design experts coming from academia and industry.

Our aim in CSP is to help you develop your own technology and know-how based upon our extensive experience in R&D and innovation.

Application to CSP

- *Central tower (CT) receiver design:*
  - Thermal layout
  - Thermal-hydraulic basic design
  - Thermo-mechanic basic design
  - Detailed engineering and certification
- *CT cavity design:*
  - Radiation and convection losses minimization
  - Raytracing-based optimization to reduce optical losses
  - Insulation design
- *CT receiver distributor and collector design:*
  - Pressure vessel code-based design (ASME BPVC)
  - Inner insulation design for high temperature HTF's (>900ºC)
- *Inlet and outlet piping design for high temperature and pressure HTF's:*
  - Insulation for controlled thermal losses
  - Thermal-hydraulic and mechanical design (clamps, bellows, insulation shell)
  - Ad-hoc flanged joints for high temperature and different piping materials
- *Linear solar collectors (Fresnel, Parabolic Trough): tube-receiver or multi-pipe bundle design or redesign for different working conditions/loads (deficient ball-joint design)*
- *RCA and predictive analysis for O&M cost-cutting:*
  - Ball-joints and flexible hose replacement analysis and strategy
  - Solar Steam Generator and TES heat exchangers malfunctions due to transients or decreased efficiency issues at design conditions
- *TES tanks:*
  - Tank checkings under API codes
  - Foundation thermal design
  - Foundation mechanical design and geotechnical analysis
- *Low-medium temperature process heat and solar cooling applications.*

We are the quality we offer

Virtualmech has been awarded different certifications which are continuously monitored and updated by our Quality Department.

- ***UNE-EN-ISO 9001:2008.*** *Quality management system.*
- ***UNE 166002:2006.*** *Management system R & D + i.*

References

- *CERSOL: High temperature and pressure ceramic receiver for solar-hybrid gas turbine and combined-cycle systems (2.5M€ R&D), partners:* Abengoa Solar, Promat HPI
- *Solar shield for central tower radiation protection (Ashlim Israel, Atacama Chile), client:* Promat HPI
- *Tower shaft radiation protection paint, transient analysis (Atacama Chile), client:* Promat HPI
- *TES tanks: thermal and geo-mechanical foundation design, client:* Promat HPI
- *TES tanks: ad-hoc design software for thermal analysis of foundation, clients:* Atria Power, Ferrostaal Smart Energy Solutions
- *Other partners/clients:* Schott Solar, TSK, Magtel, Sener

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