InnovationLab by DRUIDS

SIMULATIONS

InnovationLab
by DRUIDS

Who we are?

1987 AUTOMAT INDUSTRIAL

The story begins in Automat with the beginnings in the wire sector starting as partners of MRB, associated with Hi-Draw and, at the same time, developing important activities in industrial automation.

2014 DRUIDS PROCESS TECHNOLOGY

In 2014, Druids takes it over and the project continues, believing in the future, with the illusion in innovation and to give continuity to brilliant technological projects.

2018 INNOVATIONLAB BY DRUIDS

In 2018, splits his engineering departments to offer to any sector of the industry the capabilities in innovation thinking, simulation, design and prototype building.

Methodology

EMPATIZAR
Vamos a unificar un único punto de vista y focalizar retos y necesidades

IDEAR
Vamos a ir más allá! Buscar ideas disruptivas y proponer ideas innovadoras.

PROTOTIPAR
Vamos a darle vida a la solución! La vamos a tocar, ver sentir, y mejorarla si hace falta.

DEFINIR
Vamos a especificar los límites y los requerimientos del reto o solución

DISEÑAR
Vamos a trabajar para conseguir el máximo detalle y precisión en el resultado de la idea

TESTEAR
Vamos a poner a prueba la solución, a comprobar la respuesta, su aceptación, su vida...

Simulation specialties

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MECHANIC FEM

- Fatigue
- Structural analysis
- Harmonic analysis
- Interference analysis
- Hyper elasticity
- Non lineal analysis
- Impact analysis

THERMAL

- Heat (radiation, convection,...)
- Thermal Fatigue
- VOF and thermal
- Solidification and melting

CFD

- Aerodynamic
- Multiphase
- Multiphase with reaction
- Conjugate transfer
- Supersonic flow
- Turbulence

EM

- Electromagnetic compatibility
- Motors
- Magnets
- High and lo
- frequency
- Eddy current an
- full wave analysis

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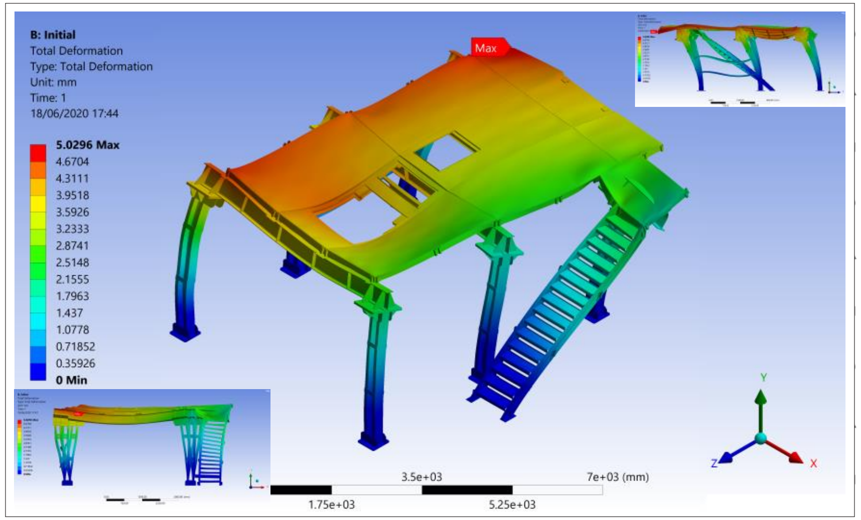
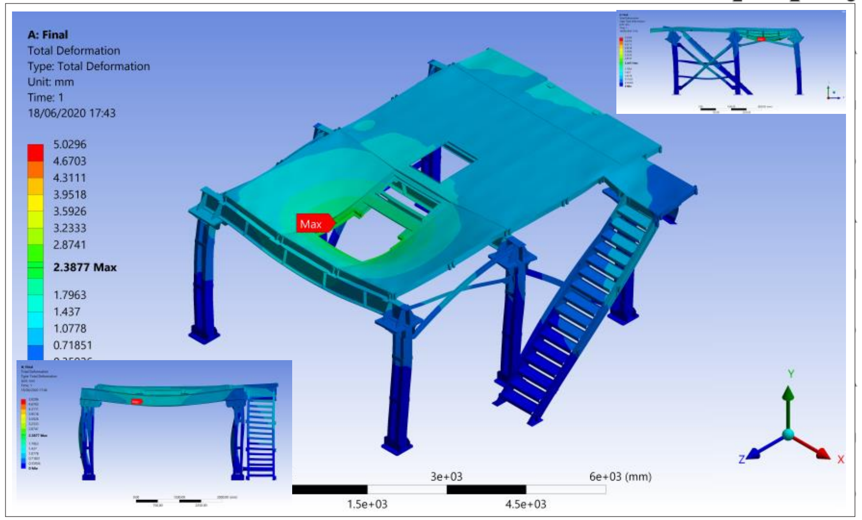
Structural studies on large structures

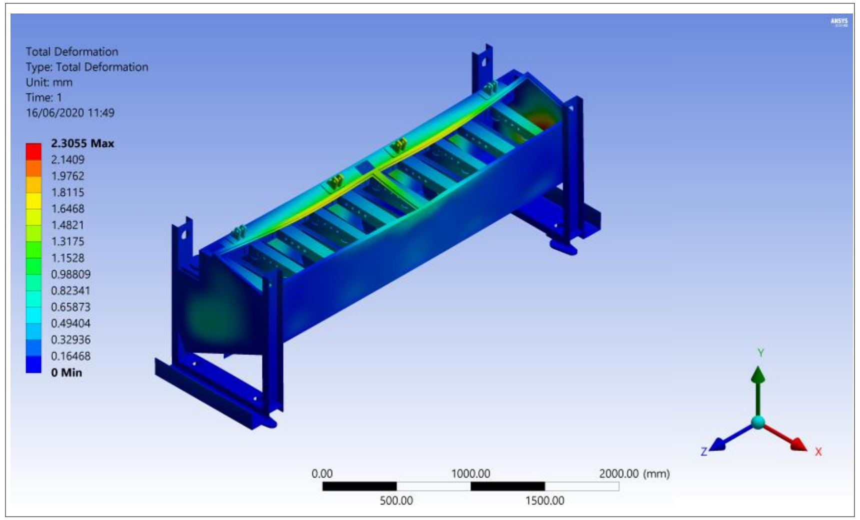
In this case a large and complex structure was studied. This structure must have allowance for machinery in the lower area and withstand a tangential force of 5 tones. For the initial proposal it was observed that the deformations were too high. To minimize them, reinforcements were placed strategically in order to not interfere with the other machines.

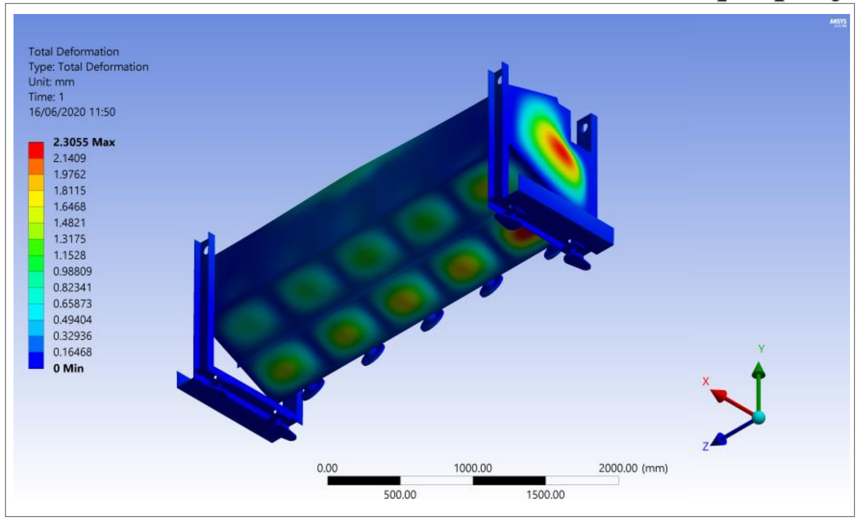




Structural studies on machines

In this case weight of the machine itself and water hydrostatic pressure are considered to find the optimal thickness of the plates of a bath for the heavy industry of metal processing. The optimal thickness found allows to reduce cost and ensure structural integrity.





Wind turbine Blade CFD study coupled with structural

The aim of this study is to analyze a wind turbine blade of 22 meters according to different external conditions (wind angle, wind speed ...) in order to understand how the air flows around it and find the values of speeds and pressures that the blade can hold. It is an example of CFD coupled with structural.

Once these values are obtained, through an FSI one-way simulation, the structural study of the blade can be carried out to determine the most critical points of the structure.

An overview with a range of alternatives to improve the resistance of the blade is achieved and the blade can be redesigned maximizing the efficiency and minimizing the risk of breakage.

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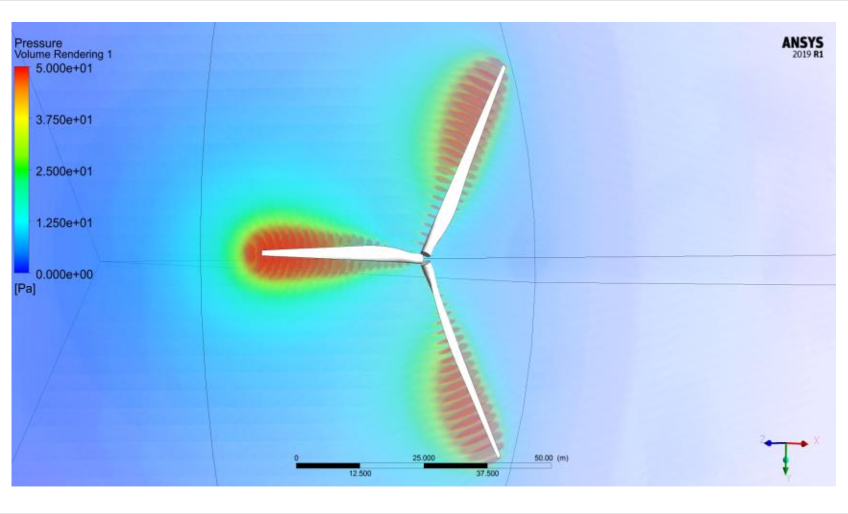

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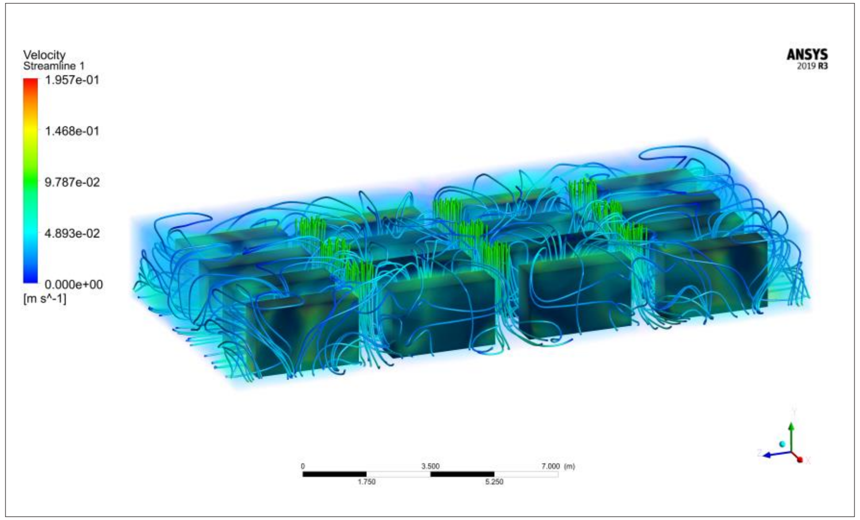
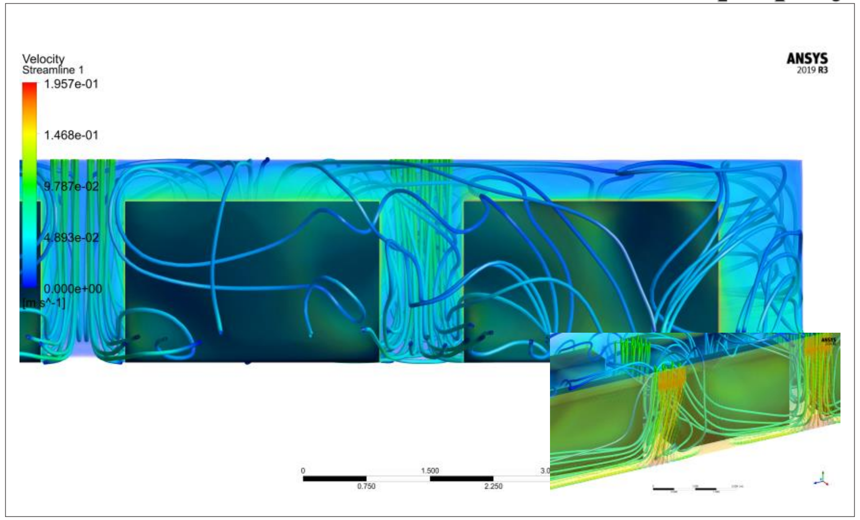
Server room HVAC

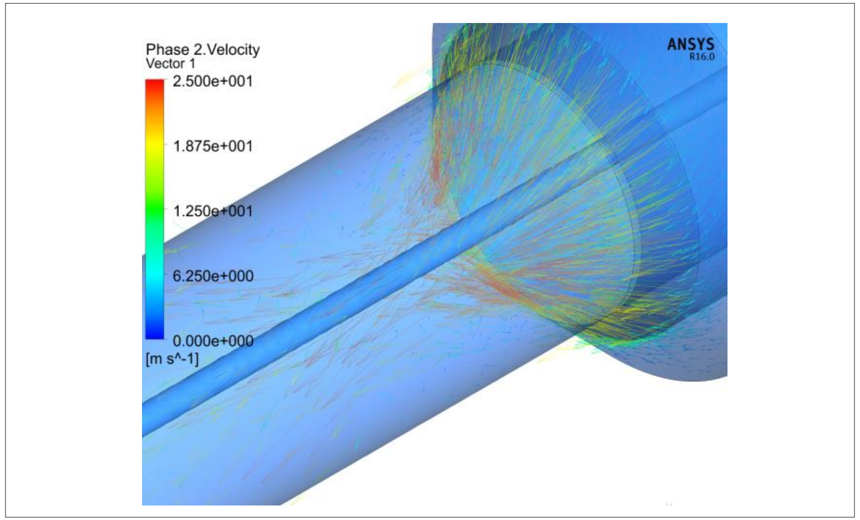
To ensure proper distribution and recirculation of fresh air, proper position, speed, temperature and turbulence is defined about the diffusers. Outlets also are modelled and positioned in order to achieve laminar flow inside the server room. The model accounts for buoyancy and temperature contribution of the server racks to the ambient.

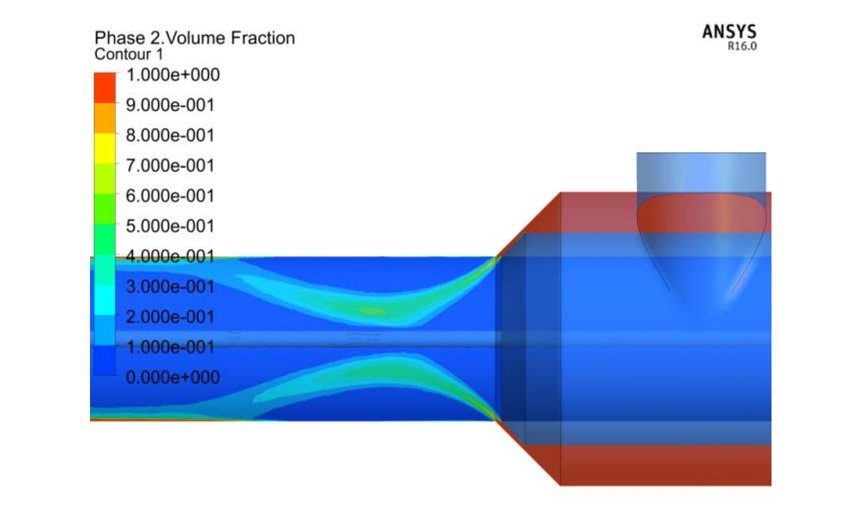




Multiphase prediction of fluid patterns

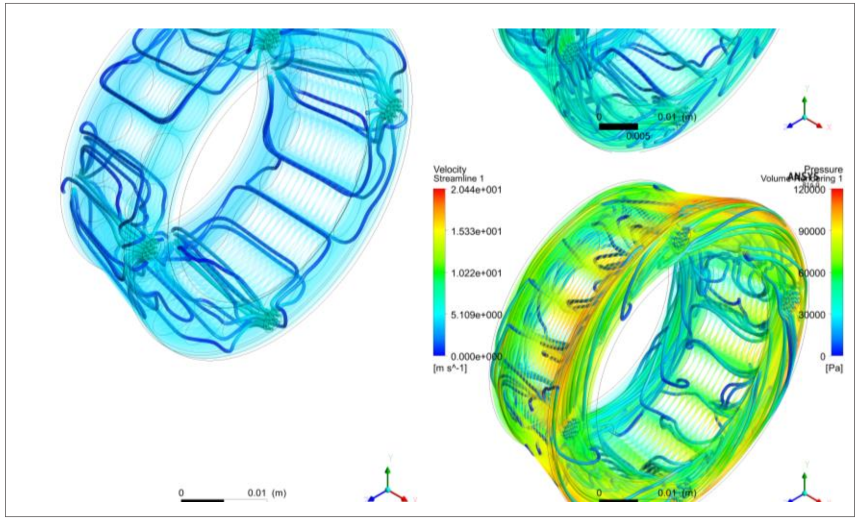
A vertical cooling system for galvanizing lines must cool fast steel wires that moves at 5 m/s from 450ºC to 100ºC must of high impact densities but at the same time it must not deform the initially liquid zinc coating, in order to achieve this a swirling injection with a 45º angle is simulated.
The system if positioned above a liquid zinc bath so no water can fall onto the liquid metal below. In order to achieve this, the cooling chambers are put in negative pression.
The complicated pattern of the cooling water must be calculated with the help of CFD model on Ansys Fluent so a VOF and Eulerian multiphase model are prepared.

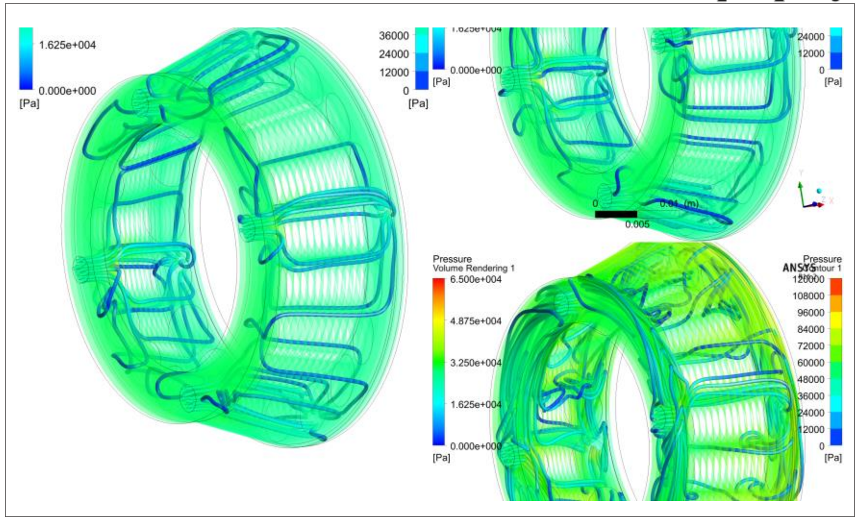




Hydrodynamic friction losses CFD on a roller

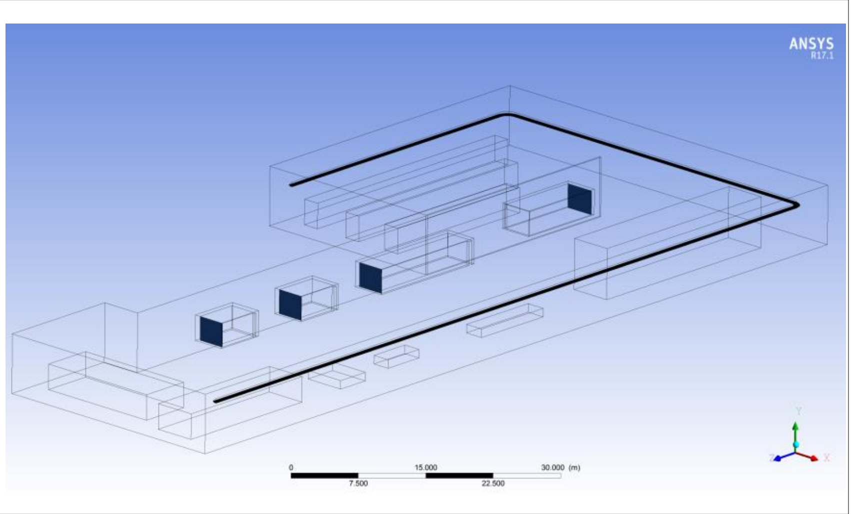
This study is focused on energy saving technologies for wire production process. The wire is produced from a rod thanks to work rolling machines. Druids Process Technology uses a state-of-the-art lubrication inside the work rolls. A work roll has a rotational speed of up to 4300 RPM and the liquid is forced to pass through the bearings: as the rotational speed rises up, the pressure loss grows too and this effect is studied through CFD analysis with Ansys Fluent using a 3D with sst k-omega turbulence model with moving frame.

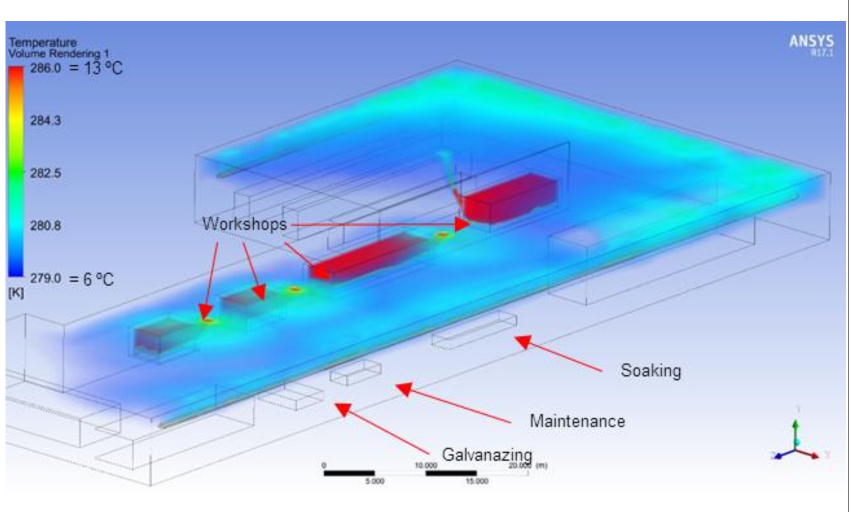




Large scale factory heating by a galvanizing line

A full-scale galvanizing line has heat generation from some of its constituent parts that can be used to implement energy saving policy in a factory installed on cold climate environment.
In this model, natural convection is modelled to simulate how the air moves inside the whole factory. Various scenarios are studied in order to take advantage of the hot currents generated by the machinery and spare energy to heat up the factory.





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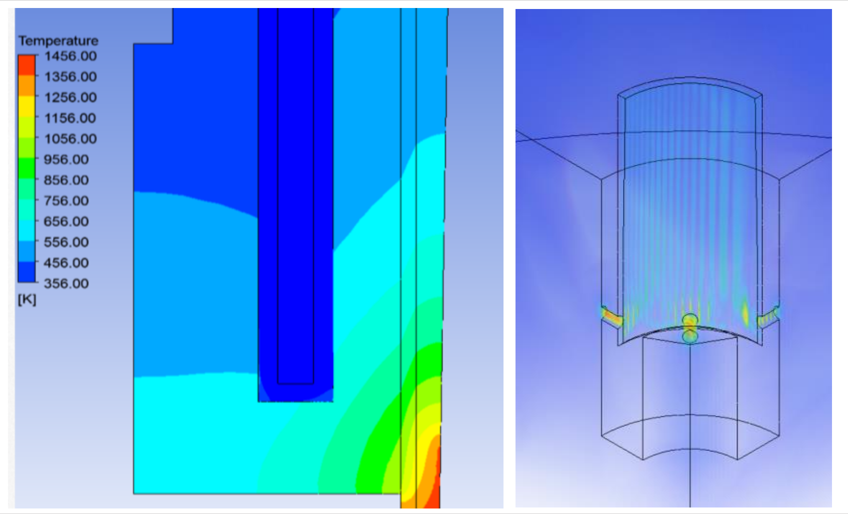
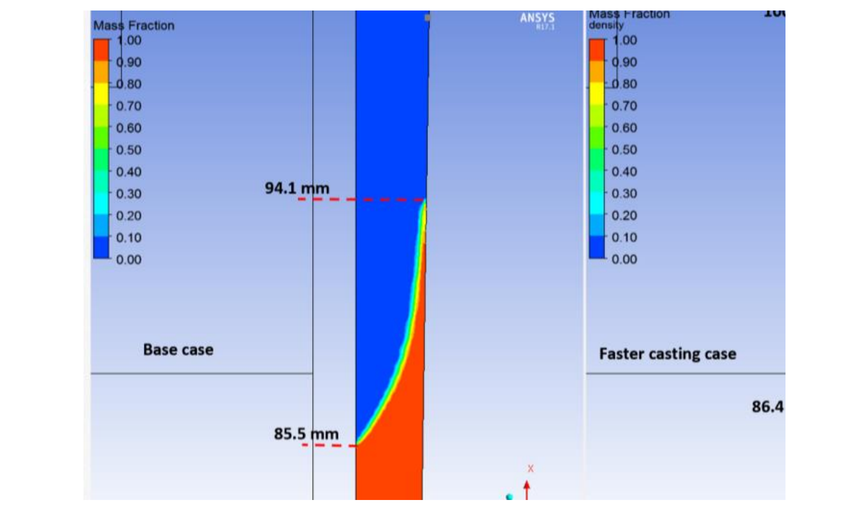
Melting/solidification model for vertical continuous casting process

Copper tube casting is an environmentally friendly process because eliminates the entire extrusion process to obtain tubes. This is achieved with high precision graphite die that is submerged in molten copper at 1400 K and inside it the copper solidifies and is drawn continuously. The shorter time to crystallize the copper, the better and faster is the process so a solidification/melting model accounting for thermal exchange within the die and an external water-cooling system gives exact solidification time and space and characterization of the cooling system.





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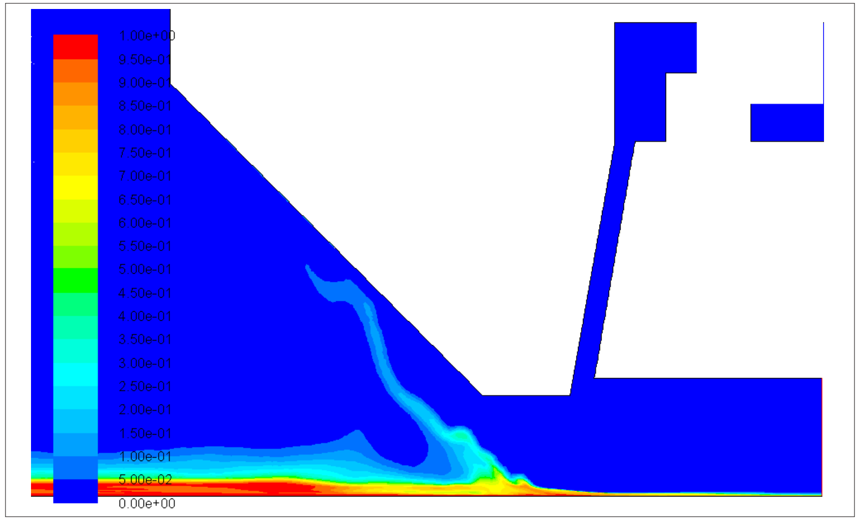
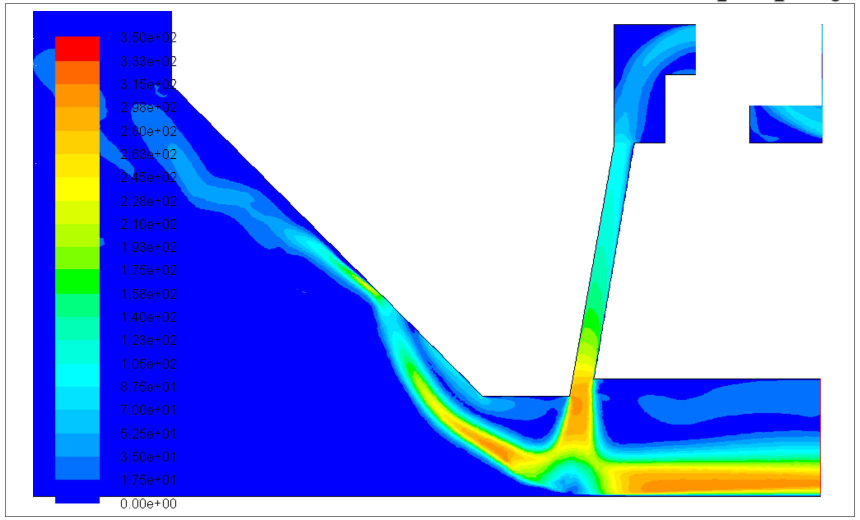
Turbulence interaction of a wiper device on molten zinc

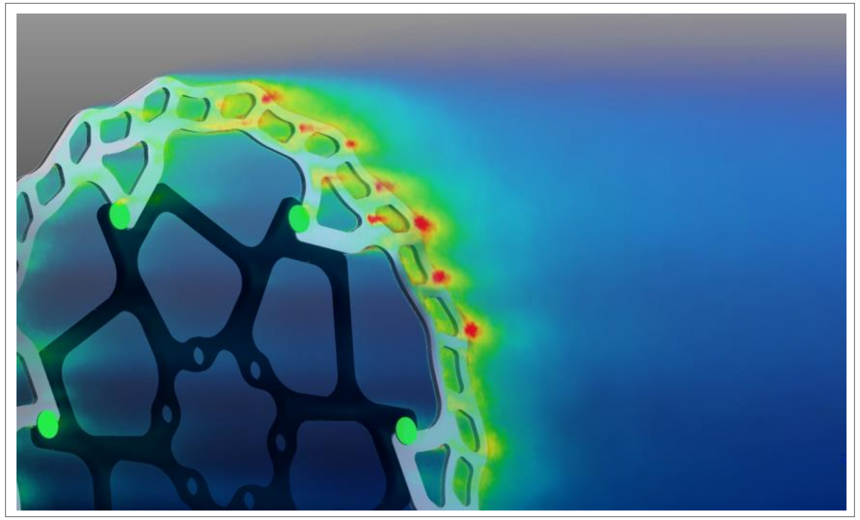
The Molten zinc is continuously drawn by a wire in an axisymmetric simulation with VOF and LES turbulence. A high-speed jet interacts with the molten zinc film. The model is used to estimate the efficiency of different geometries of jet wipers. Gravity is also accounted for.
Model can be easily expanded to account for solidification melting simulation.

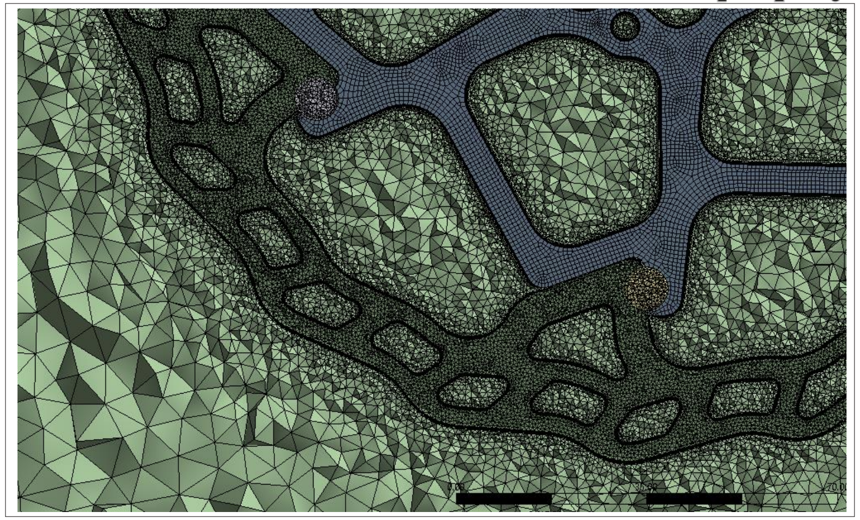




Multiphysic brake disk aero-thermal analysis

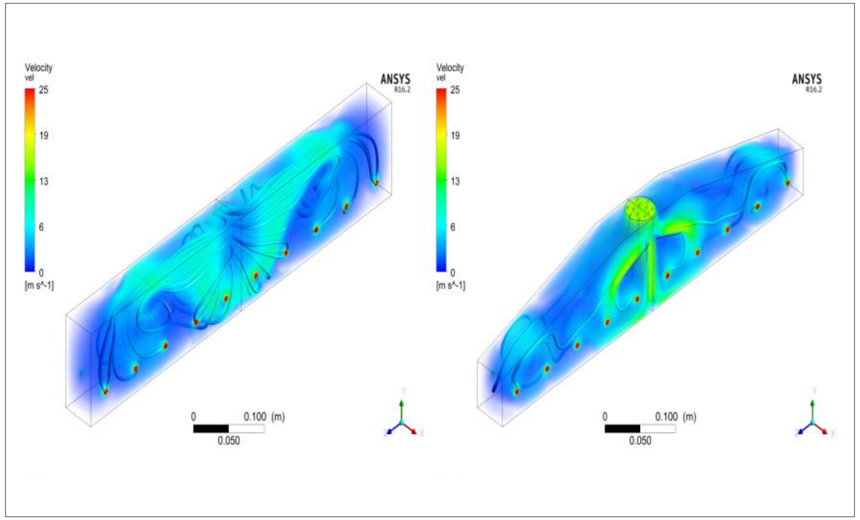
Performance of disk brake rotors depends largely on their heat evacuation capability. The rotor must be at the same time stiff and light. In this study, a UDF is used to simulate the heat generated by friction of the brake pad. The model accounts for rotation of the disk and motion of the air that dissipates the heat. The same geometry is used to study the mechanical behavior with the temperature input from the CFD model.

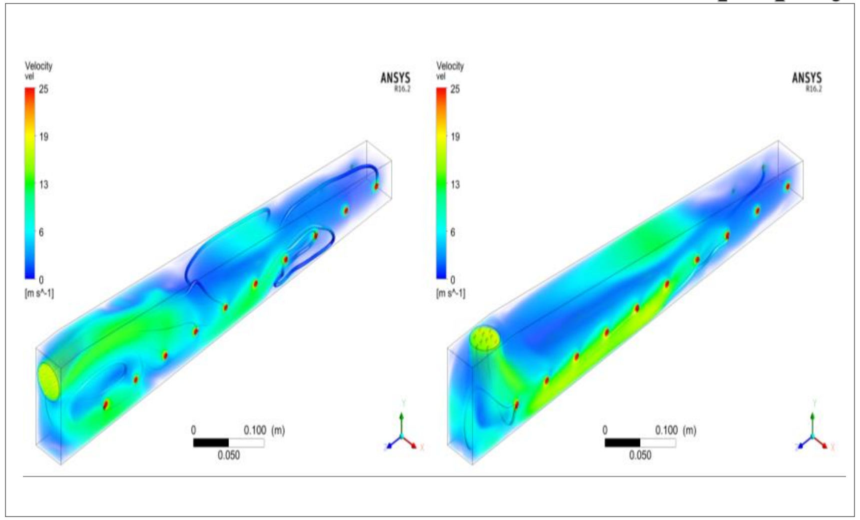




Collector design

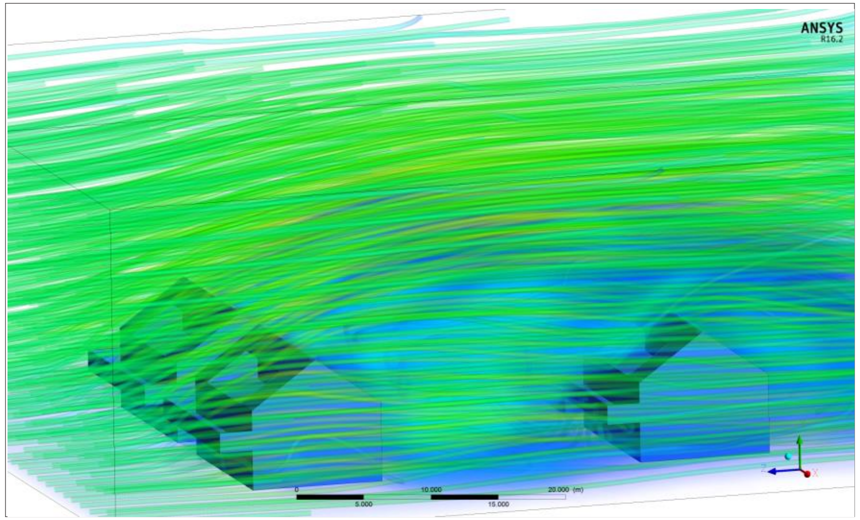
A plenum (collector) is studied to find the optimal configuration to achieve the desired distribution of flowrate at the exit. Turbulence and compressible flow are considered in this case. Different geometries are proposed to optimize distribution and minimize pressure drop.

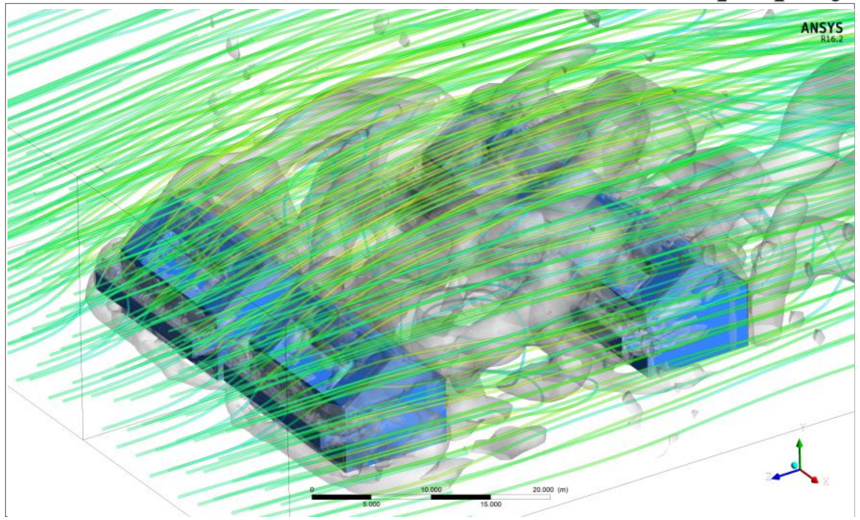




Aero-acoustic study on chalets under high wind frontal load

Aero-acustic noise is generated by turbulence when creating low frequency pressure disturbances and that indeed is an issue in buildings design. In this case a strong current is simulated with a modified large eddy simulation (LES). Acoustic spectrum is studied to find the minimum speed of air at which noise start to be perceivable from people inside the chalets. Q-criterion surfaces shows existence of vortices created in the wake of the 1st row and 2nd row of buildings.





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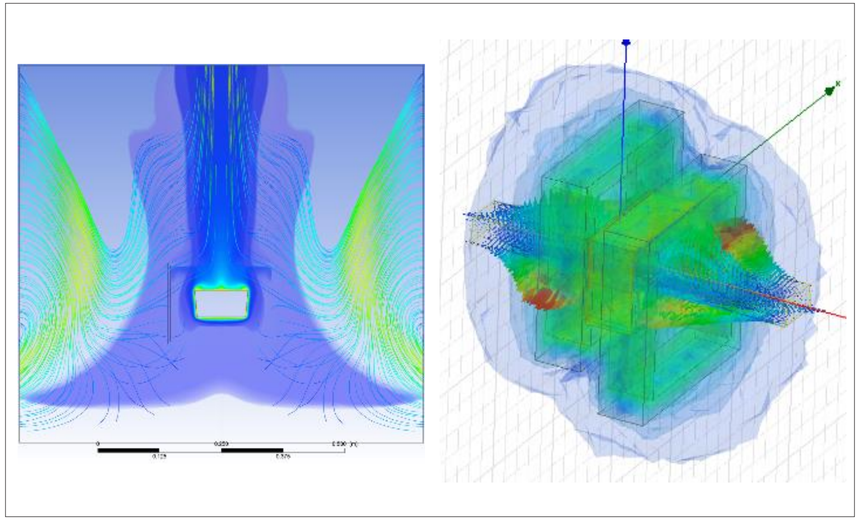
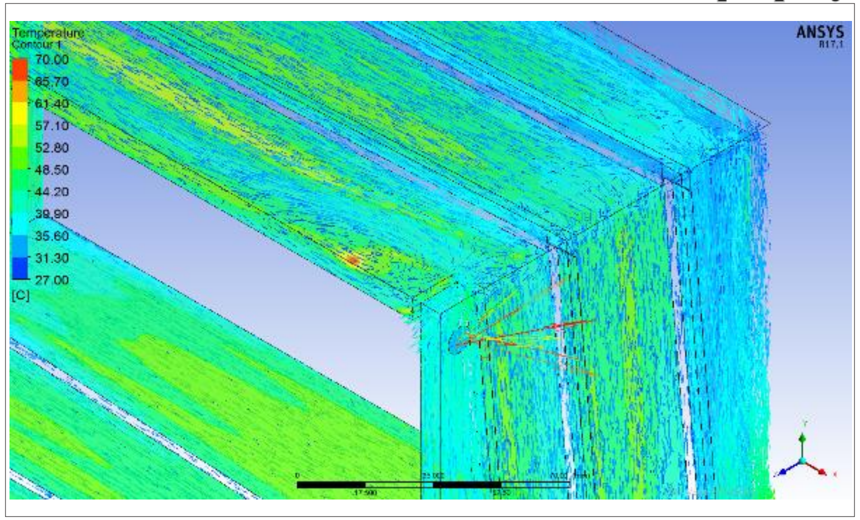
Multiphysic analysis of an EM flaw detector for billets (Winner Hall of Fame 2020)

Non-ferromagnetic billets are continuously casted and after solidification drawn to obtain rod. This is accomplished with costly and heavy machinery which stop times must be reduced as much as possible. When the solidification is faulty and a hole inside the billet appears, the drawing process is stopped because a rupture is produced. In order to prevent and detect the flaw inside the billet a custom detector using a low frequency EM field is designed. As the detector must be close to the billet to enhance the reading accuracy, the device must withstand the intense radiation of the billet at 950ºC and the coil must be cooled carefully in order to carry the current to generate the EM field.
A study involving eddy current heat transfer coupled to fluid turbulence is done. The EM field simulation is also used to study the sensibility of the sensor. The radiation/CFD with natural convection serve as auxiliar heat input for the coil thermal/EM simulation.

11th Annual ANSYS HALL OF FAME COMPETITION 2020





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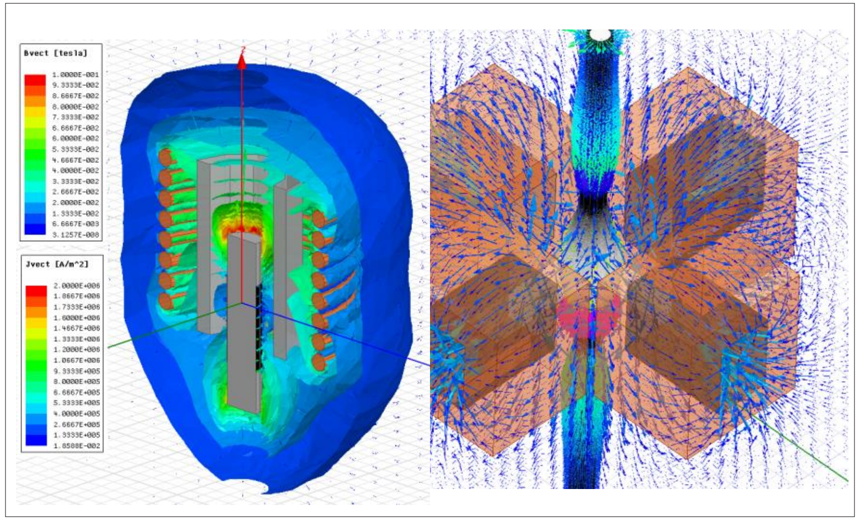
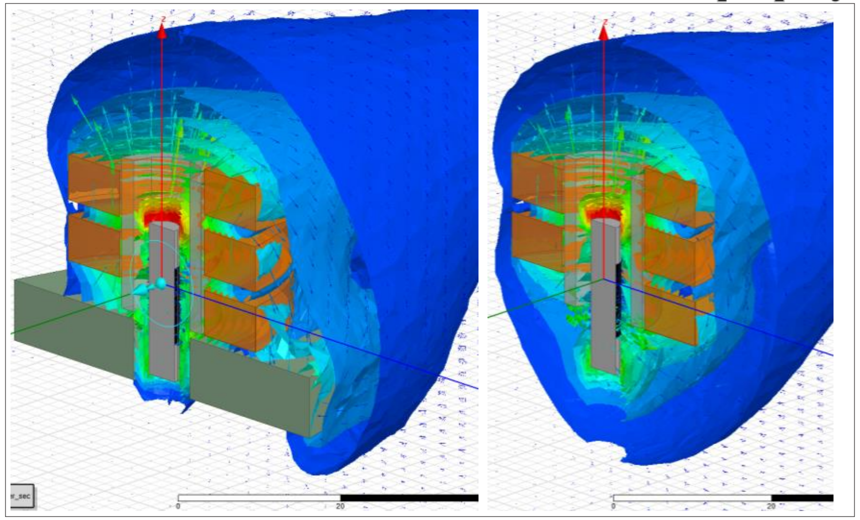
EM current induction device for cylindrical moving parts

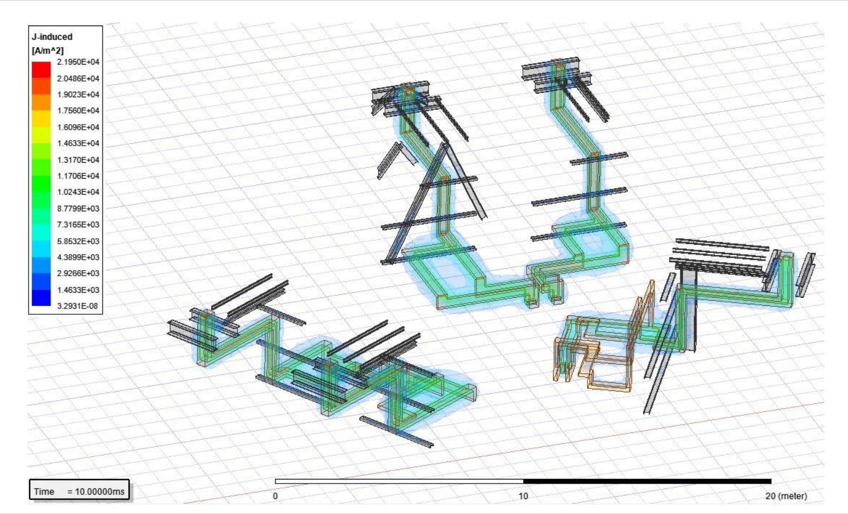
A multi material cylinder, inner ferromagnetic and outer layer non ferromagnetic, is moving inside a kHz oscillating field produced by a coil and a concentrator configuration. Counter and co-field options are compared, different frequencies, different concentrator materials, the effect of saturation on ferromagnetic target and speed dependency are simulated in this transient EM model in Maxwell in order to find the maximum possible current induced on the thin layer of non ferromagnetic material.

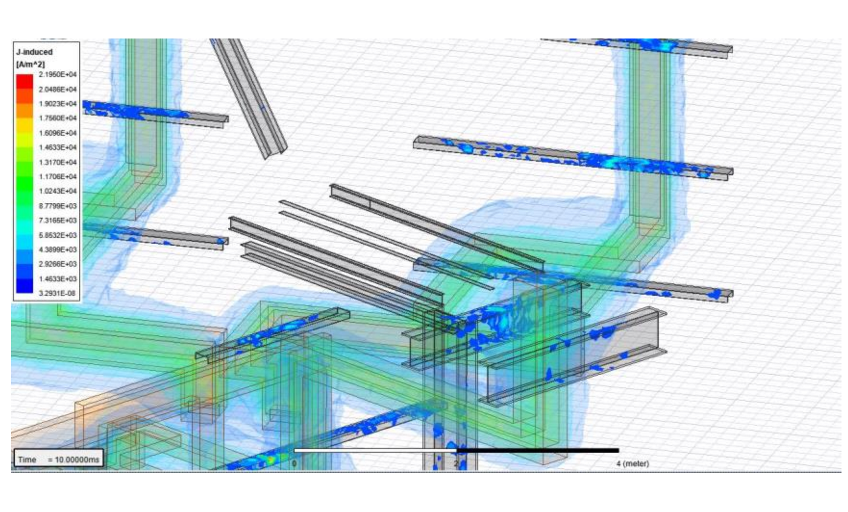




EM compatibility and risk in a high current copper bus bar

High current copper bus bar. Current coming from the rectifiers circulates through the bus bar were up to 17000 A.
A health hazard study is conducted to check the risk for humans staying near the bus bars.
Although the system works in DC current, there are harmonic frequencies that induce currents in the structures and, as the human body is much more sensitive to AC fields, these are being assessed with eddy current in Maxwell.





Where to find us?

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Druids it.

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