aiguasol
LATAM

Who We Are

A I G U A S O L, founded in 1999 in Barcelona and with 9 years of presence in Chile, is a global consulting, engineering, R+D, development of technology and solutions in the field of energy, made up of a **multidisciplinary team** of engineers, doctors, architects and acredited professionals **LEED AP, CEV, CES, CVS, ISO 50.001 y AChEE,** with experience in both public and private companies.

We have **offices in Barcelona and Santiago**, as well presence in Concepción (Chile), Portugal and Colombia

Our Team

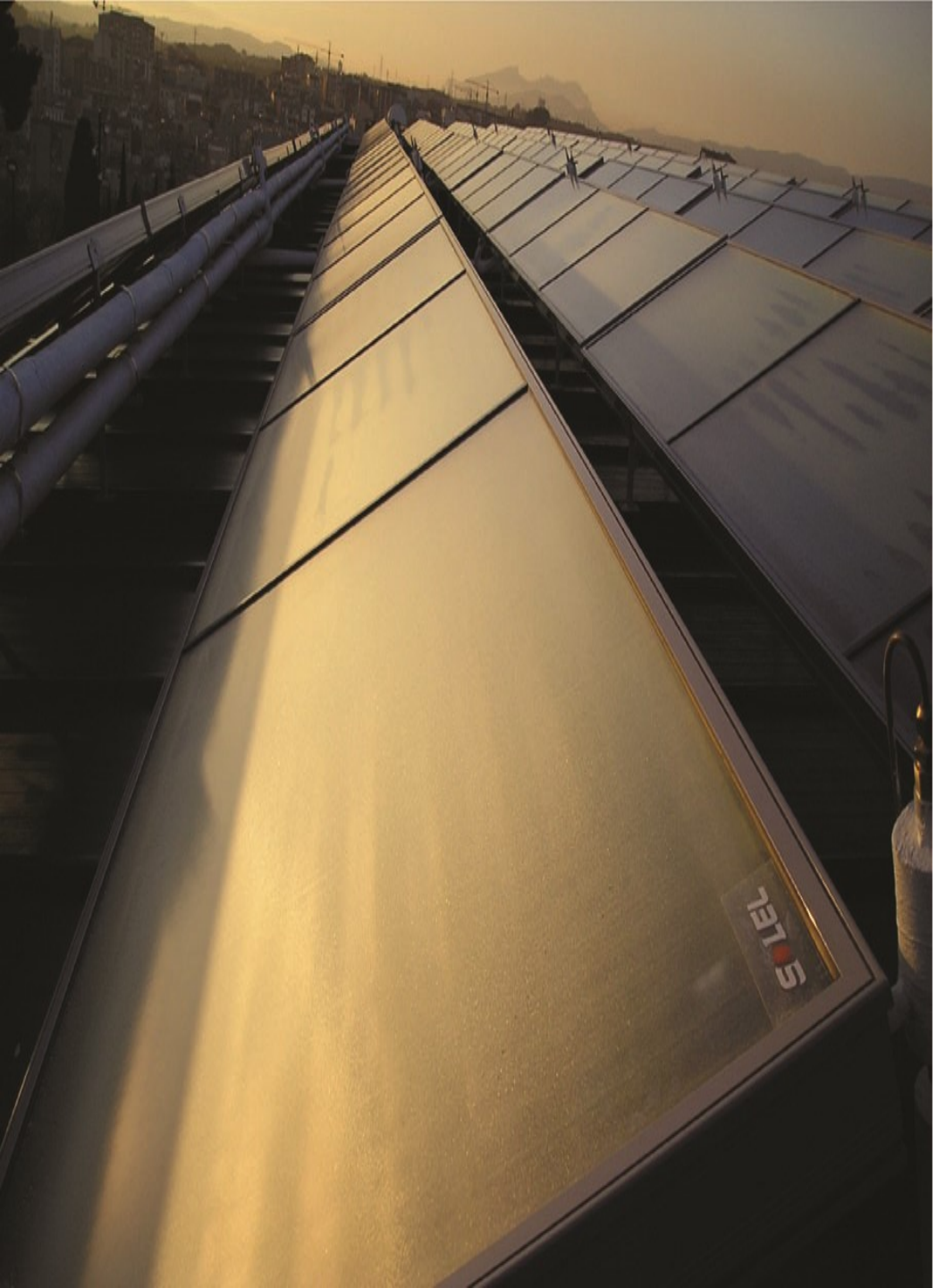
A I G U A S O L, has excellent CAE specialist with more tan 20 years of experience in fluid-Dynamic and system simulation.

In addition to a vast experience and diversity of simulations, experimentation and validation realized successfully, creating a solid team at a technical level for solving the problems raised by costumers.

Our Team

Our specialist have certifications from ESSS Institute addressing the topics:

Fluid Dynamic Analysis
Multiphase Flows
Heat Transfer
Reactive Flows and Combustion
Fluid-Structure-Interaction (FSI)
CFD-DEM Coupling (Rocky)



Your Energy Partner

Our Services:

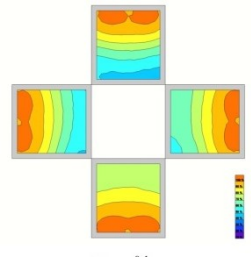
- R+D Services. Product development and development of innovative solutions.
- Energy efficiency consulting services for strategic planning.
- Energy efficiency consulting services for interior comfort and sustainability.
- Engineering services.
- Software development and calculation services.
- Formation and training.

PVSYST

DesignBuilder SOFTWARE

TRANSOL 3

TRNSYS 18



DAYSIM-RADIANCE

ANSYS FLUENT

Our Tools

Simulation Capabilities

Ventilation and energy optimization for buildings

Evaluating ventilation of any bulding structure and analyzing the interaction between mechanical equipment and improving energy performance.

Development/Optimization of new technological aplications

Characterizing the development of a new producto, prior to the development of a prototype or optimizing the characteristics of an already developed product.

Thermal processes aplied to industry

Simulating heat transfer in mechanical processes, avaluating temperatura of closed enviroments and developing characterization and evaluation of cooling techniques.

Hydraulic characterization of systems

Visulaizing the Flow circulation in closed spaces and characterizing hydraulic equipment whose characteristic curves are unknown.

Simulation Capabilities

Industrial plants studies with coupling in TRNSYS

Simulating improvements in an equipment or process, and the in TRNSYS see how the improvements in the industry affect.

Environmental phenomena studies

Characterizing the behavior of wind Flow, so the enviromental comfort can be visualized. Studies of water flows and the behavior of structures in the fase of these flows.

FSI Coupled simulations

Simulating the interaction that exist between solid and fluid Dynamic systems, allowing characterizing forces, pressures and all the parameters that participate in the interacción.

Technological development and R&D

Applying the knowledge managment, innovation and simulation, industrial designs are worked to improve the problems detected, allowing in some cases to generate associated patents.

SOME SUCCESS STORIES

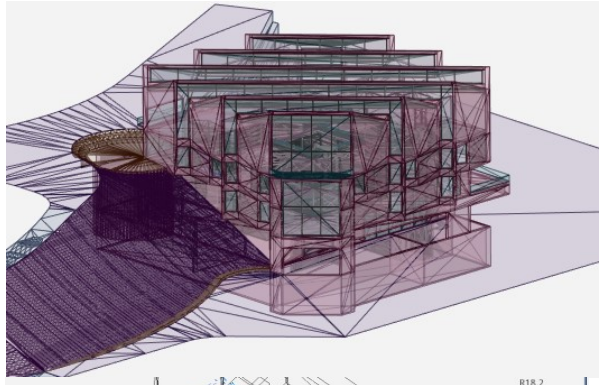
BUILDING & STRUCTURES

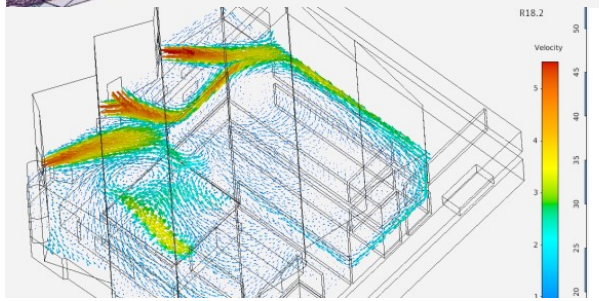
Natural Ventilation CFD Study at Sorigué Foundation Museum

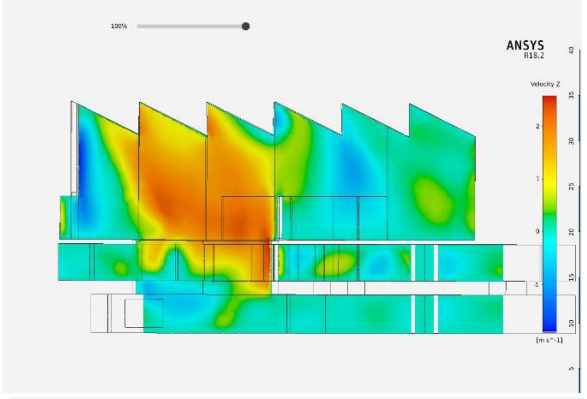
The goal of the study is to identify the speeds and pressures close to the atrium and to make an improvement to the museum's ventilation in order to reduce the need for mechanical ventilation.

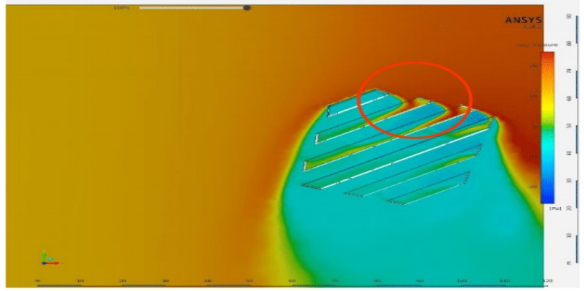
Among the most important results is the proposal for incoporate 5 Windows of 3.75 m^2 that improve the natural ventilation effect at the museum, managing to increse the air flow that is influenced to go out by the upper deck.

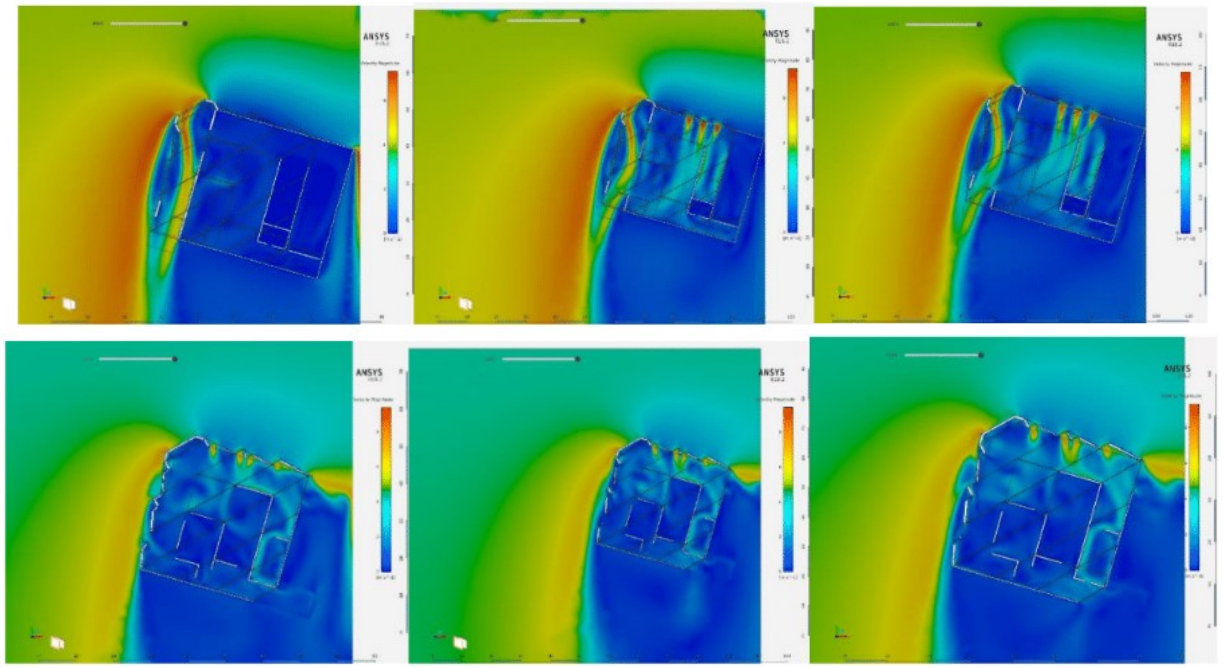
Client: Sorigué Foundation









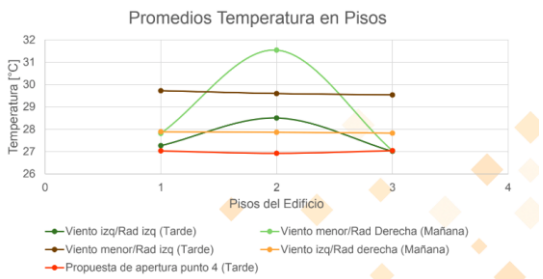


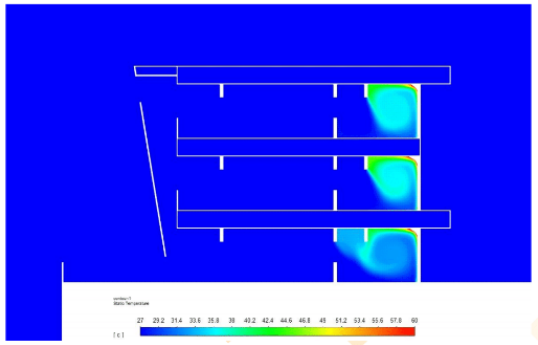
Influence of the Facade on Ventilation of the Renca Municipal Complex

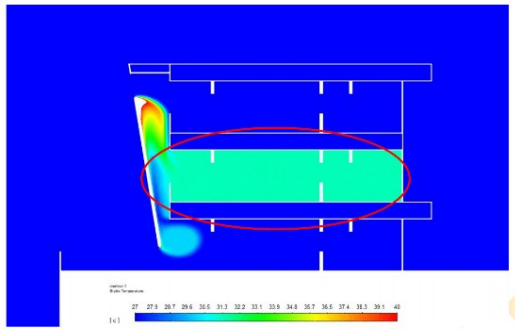
CFD simulation of the influence of the glazed facade on natural ventilation by the effect of the atriom. The change in density and speed in the áreas near the facade was evaluated to assess its air draft capacity.

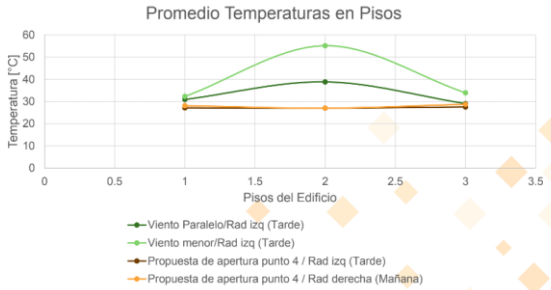
This simulation allowed the client to make decisions regarding the building's ventilation system, achieving to seethe áreas with the greatest influence on the phenomenon of natural ventilation.

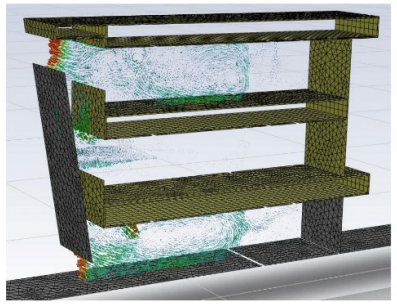
Client: Municipalidad Renca

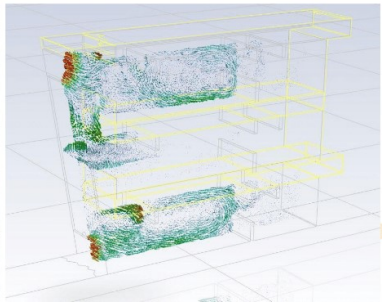


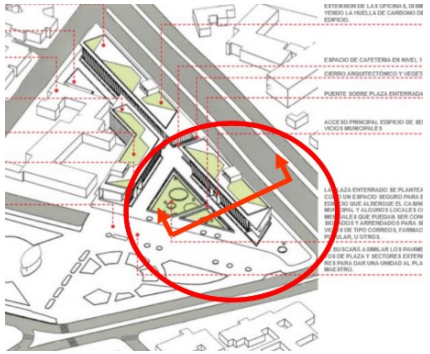


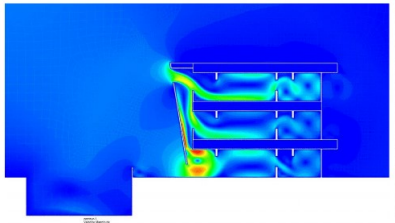


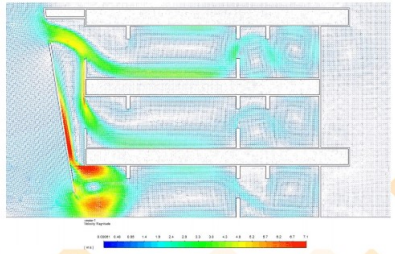


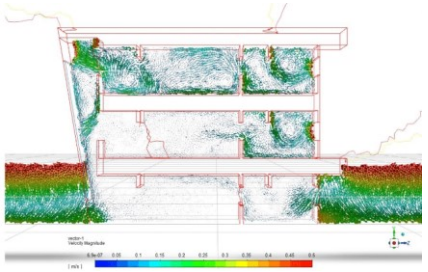










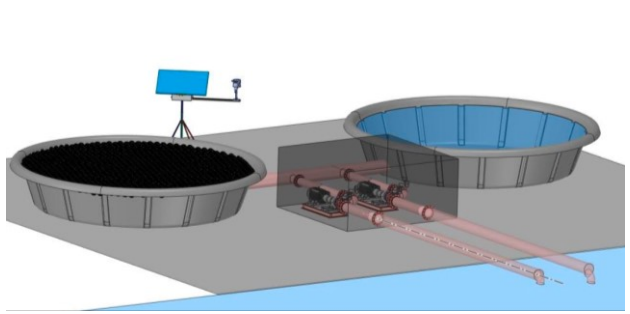


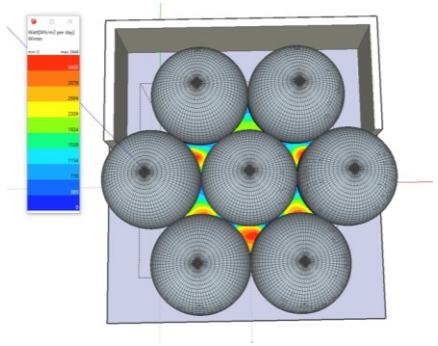
INDUSTRY

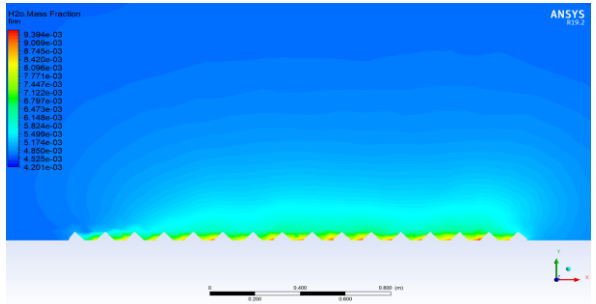
BARRIER BALL®+

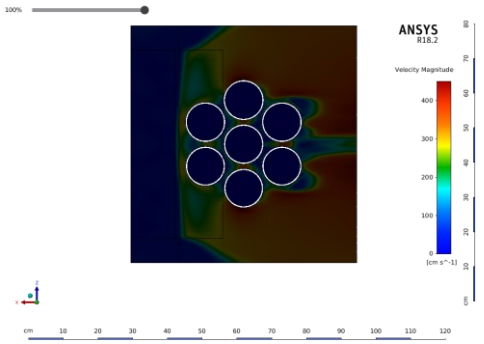
Development of a new versión of BarrierBall®, called “Barrier Ball® plus” through critical analysis of its physical characteristics that allow a better coefficient of heat and mass transfer, together with the complementary and integrated development of an evaporation model that gives rise toa verification system of the performance of the producto “in situ”. We also work on an article “***An Innovative Non-Interfering Aeration System for High-Current Density EW Processes***” that was presented at the Hidroprocess 2019 in Santiago de Chile.

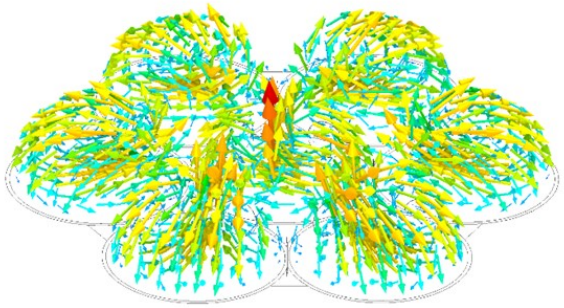
Client: Broncería y Plásticos EXMA Ltda









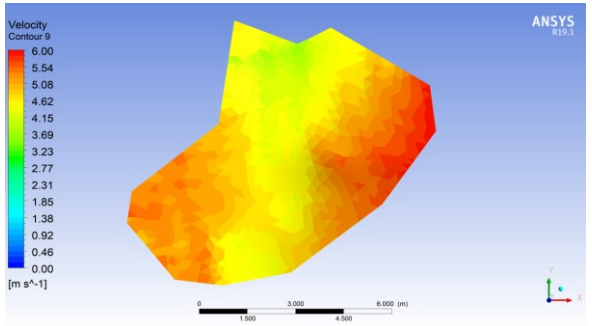


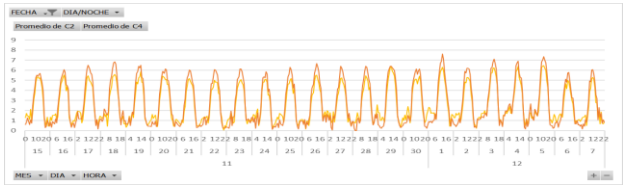
Study of the Wind Local Effects on the C4 Raft at Quellaveco

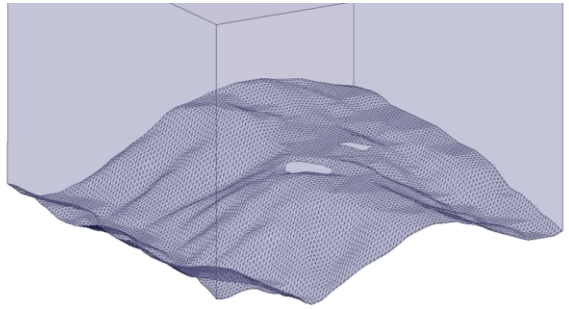
The main goal of the Project was to analyze the wind distribution on the C4 raft at Quellaveco mine, Anglo American Quellaveco S.A. (AAQSA), based on local winds with the aim of establishing a ratio between the local wind measured by the weather station and the speed of the different points on the raft. With this information, could be fed the evaporation model and make an estimate based on the indirect model.

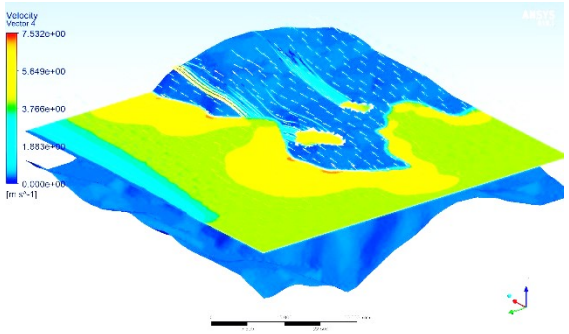
Using CFD simulations, differences of ± 200% with to the wind speed measured by the meteorological station could be observed.

Client: Broncería y Plásticos EXMA Ltda







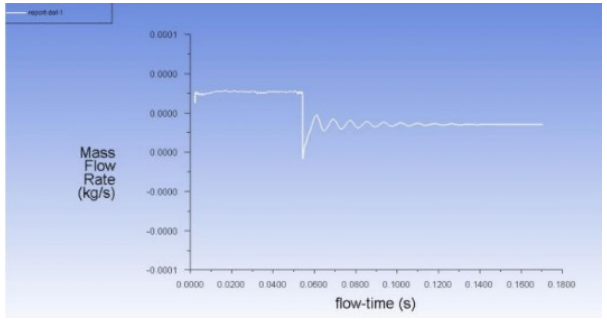


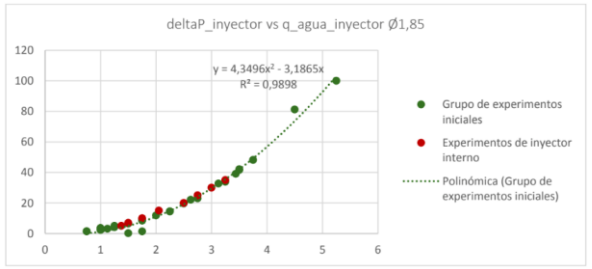
EXMAJET®, an Integrated System to Improve the Production and Quality of CU Cathodes

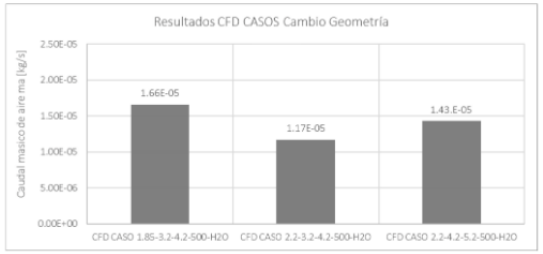
Project for optimize the design of an air-electrolyte injection jet that obtained financing from CORFO and qualified for R&D law, generatin great technical and economic befits for our client. At the ending of the Project, we do a field test in a mine wrote an article called *"An Innovative Non-Interfering Aeration System for High-Current Density EW Processes"* that was presented at the Hidroprocess 2019 in Santiago de Chile.

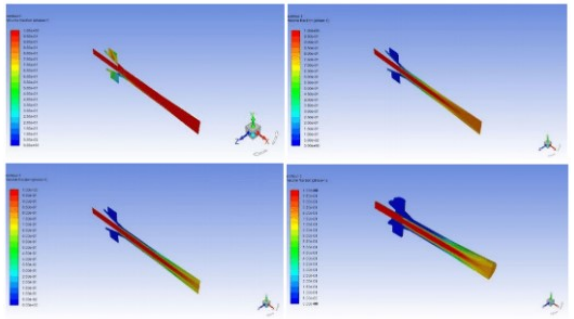
The análisis performed consisted of a transient análisis of a multiphase model that shows a mixed electrolyte-air Flow. Also, system's pressure drops was verified.

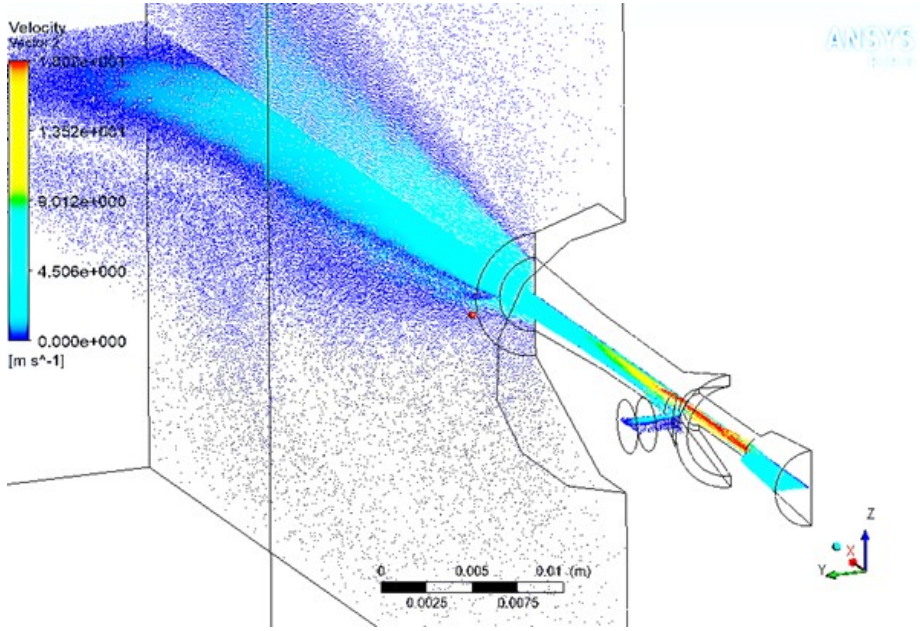
Client: EXMA Ltda

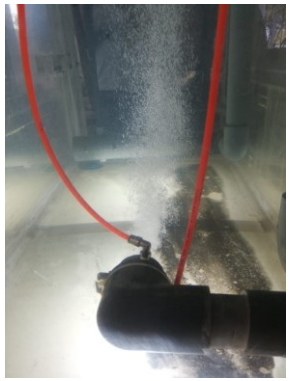


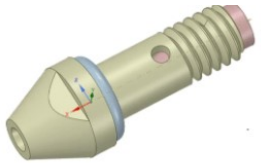












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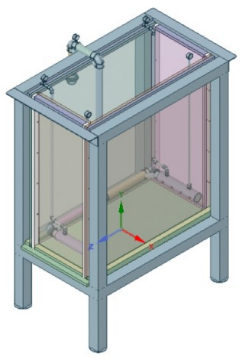
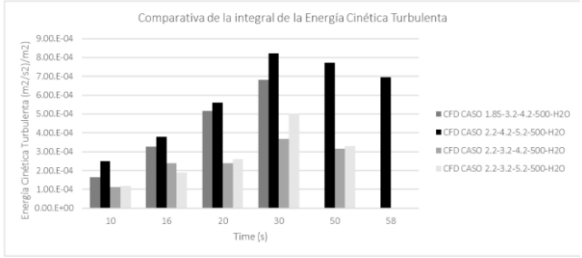
EXMAJET®, Optimization of Internal Turbulence in Electrowinning Processes

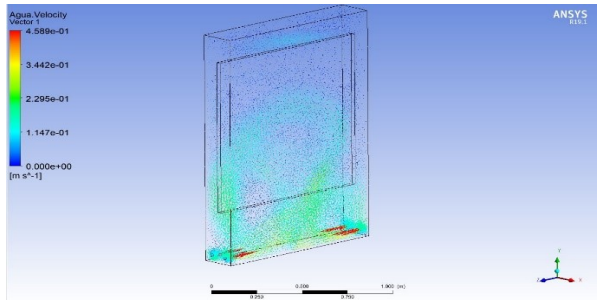
Using CFD simulation and experimentation, turbulence models in the electrowinning tanks were validated, allowing to improve the deposition of copper. The results show that the optimization improved by 30% the aeration, a parameter strictly related to the turbulence and quality of the final cathode.

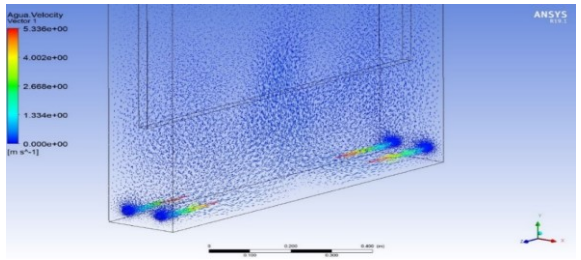
The Project obtainend founding from CORFO and qualified for R&D law, generating great technical and economic benefits for our client.

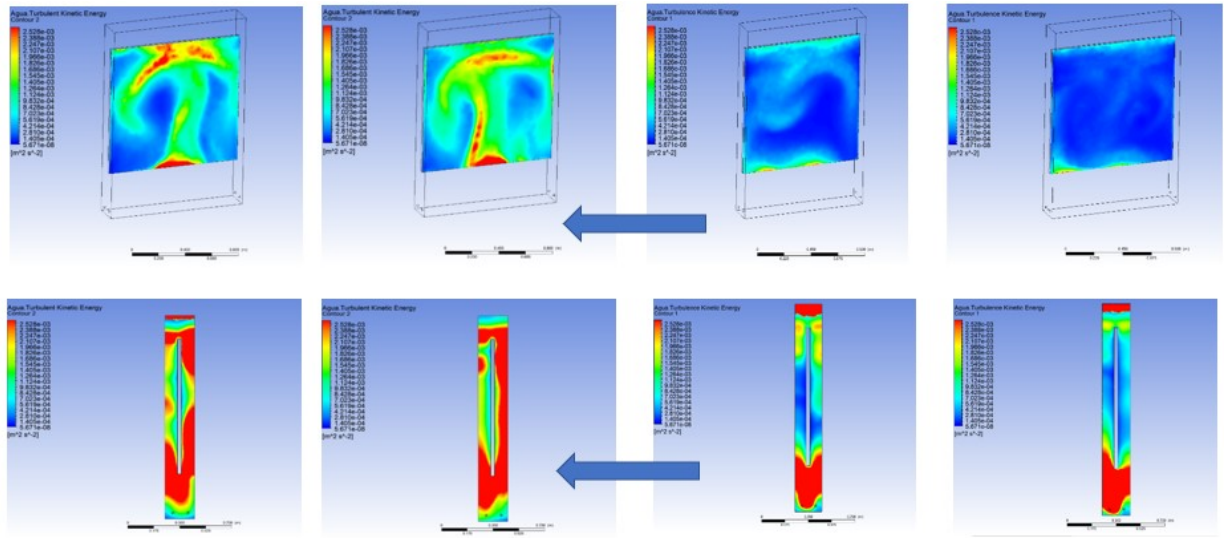
Client: Broncería y Plásticos EXMA Ltda

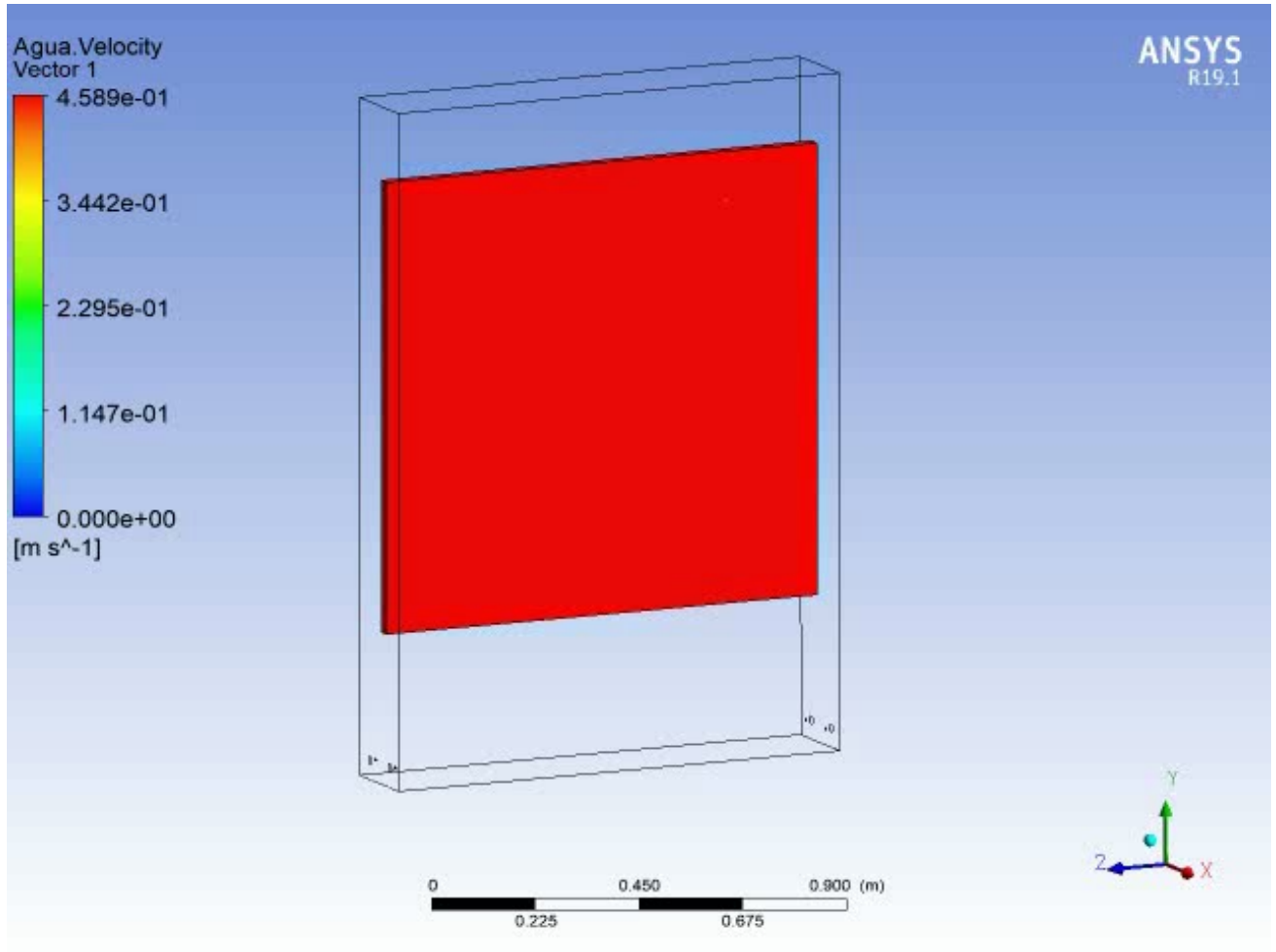












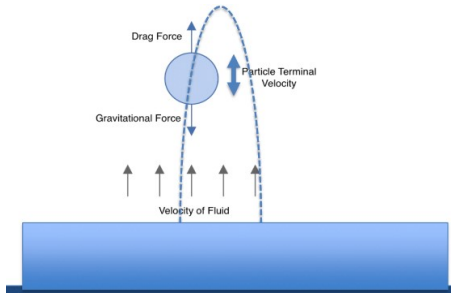
Muliphase analysis allows incorporated a mixed Flow that directly affects system's pressure drop, in addition to being able to identify differents areas with pressure differences. It allows to identify areas where to improve within the producto.

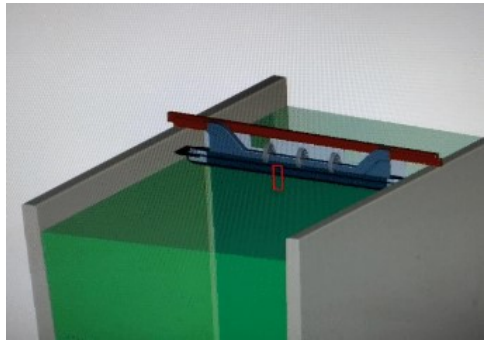
ECAPS®, Integrated Pollutant Reduction System for High Current Density Electrowinning Processes

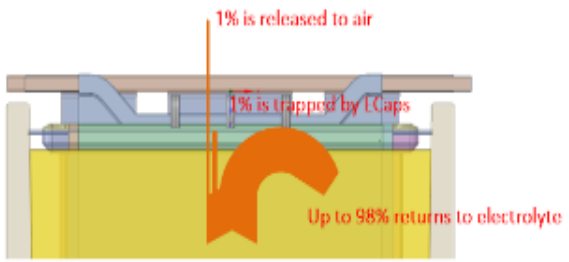
ECAPS® is a system of brushes arranged in the Surface lattice of the cells, which reduces the output of acid mist caused by stirring with bubles, in addition to reducing energy losses from the process. The análisis carried out consisted of a transient analysis of a DPM model of the Eurlerian-Lagrangian approach to characterize the transport of pollutants.

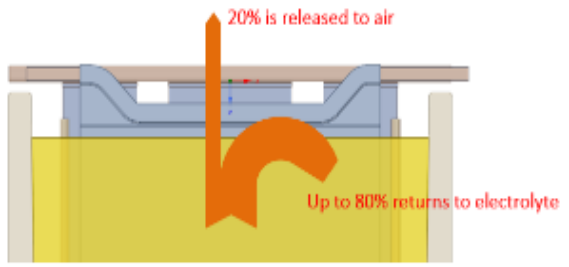
Through CFD simulations and experimentation, it was posible to characterize a reduction in emissions by 95%.

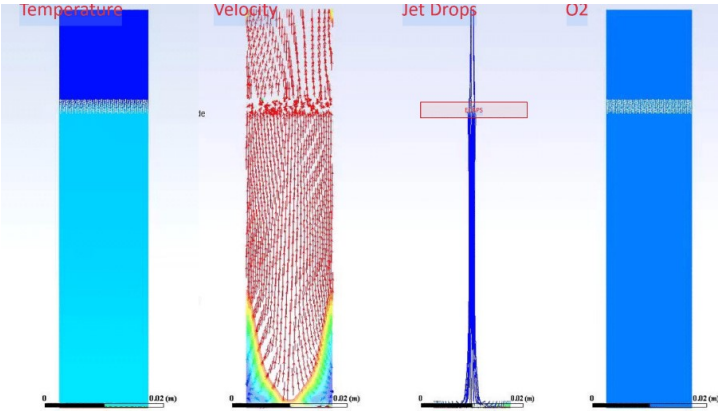
Client: EXMA Ltda

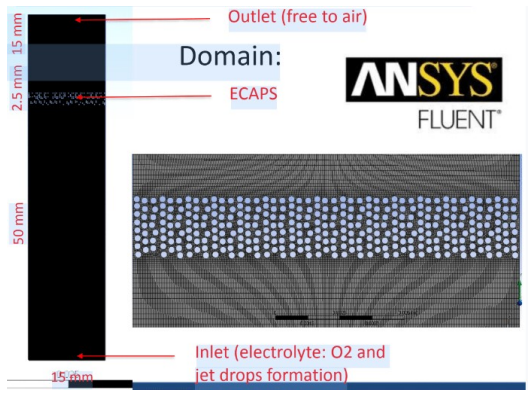


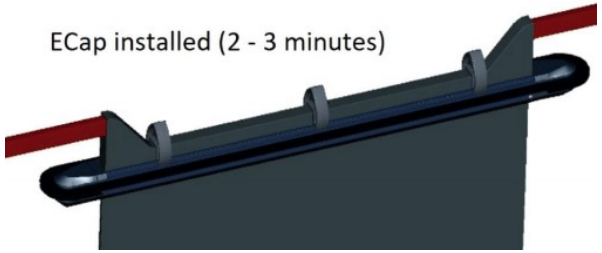


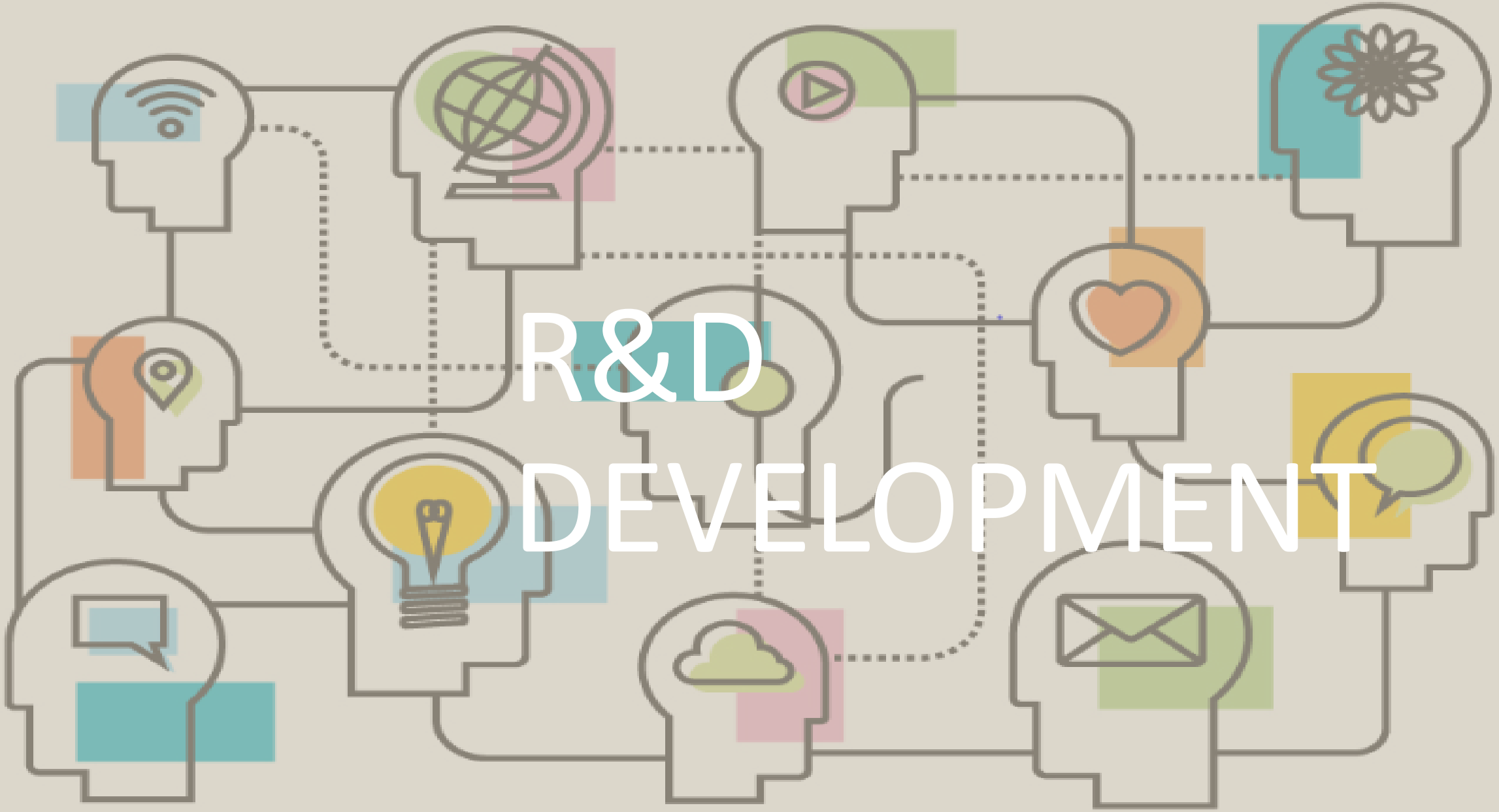












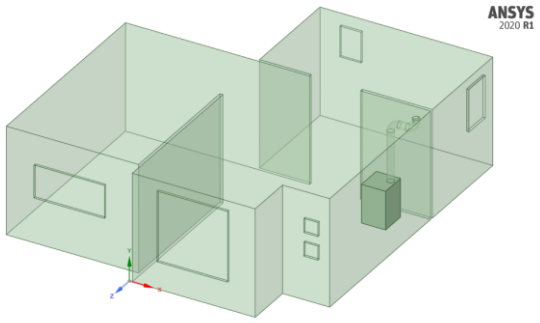
R&D DEVELOPMENT

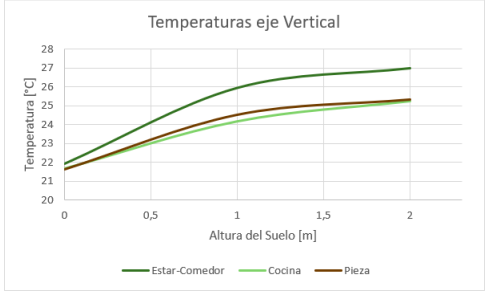
Zero Emissions Stove for District Heating

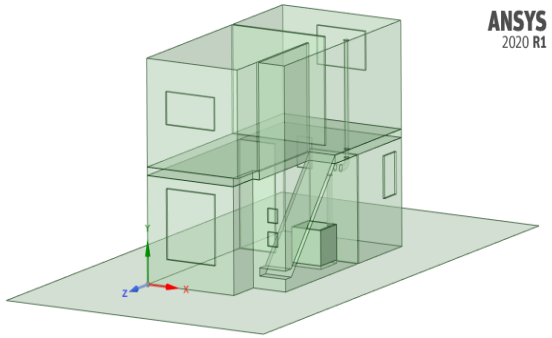
Development and design with CFD of a convective-radiative stove prototype that uses a hot water connection to the district heating for heat homes in southern Chile.

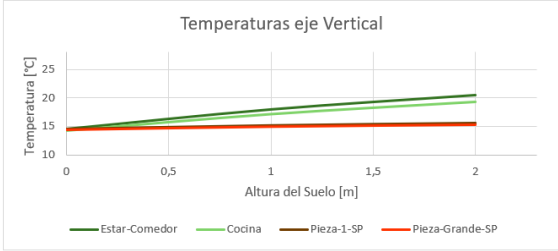
Using CFD simulation, heat fluxes, temperature and Flow rates that were generated inside standard homes were evaluated, being able to optimize operational parameters of the heating system.

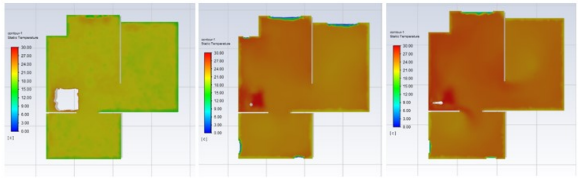
Client: Own Development

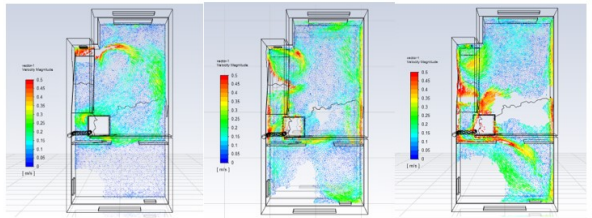


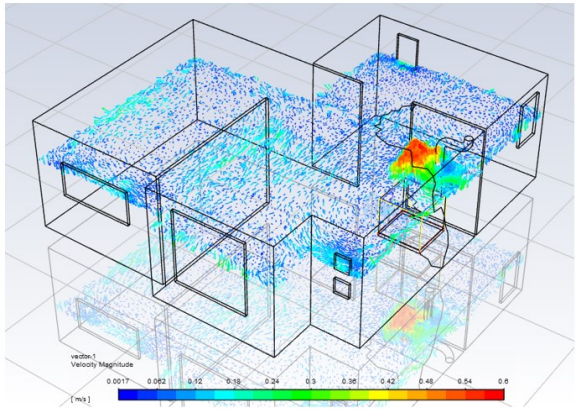


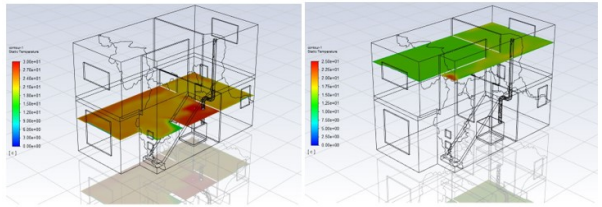


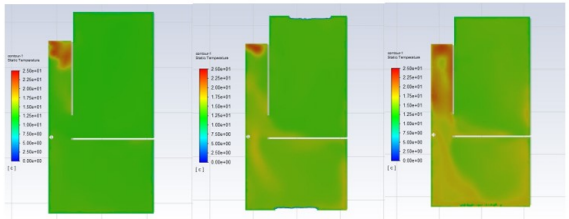










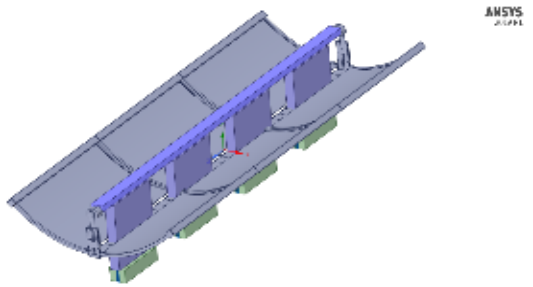


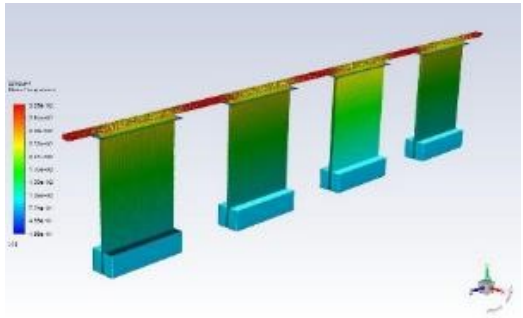
ISSC, Inertial Solar Solid Concentrator for Refractory Drying Process

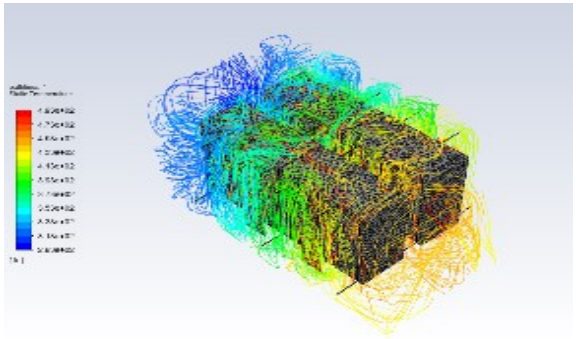
The aim of the project is to design a concentration solar system for heat transfer by conduction, based on the Chilean industrial patent 55993 by Mr. Humberto Piemonte, which we Will call ISSC for its initial “Inertial Solar Solid Concentrator”.

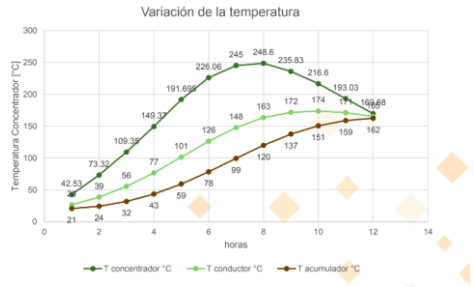
Development of a CFD model of the concentrator (transfer of concentrated solar radiation into termal energy) with conductors (transfer of termal energy from the concentrator to the accumulator) and accumulators of the preheating process air of the refractory drying.

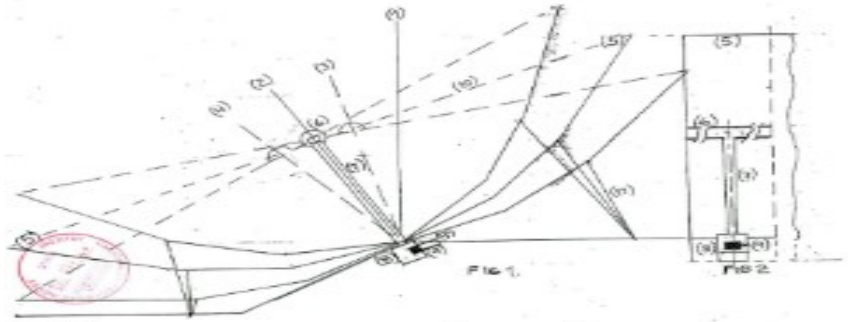
Client: SERVITAP

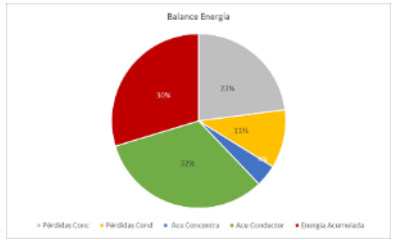


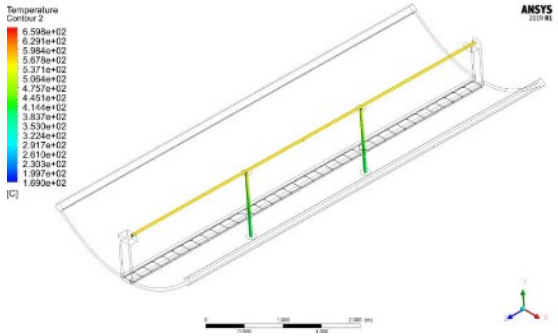


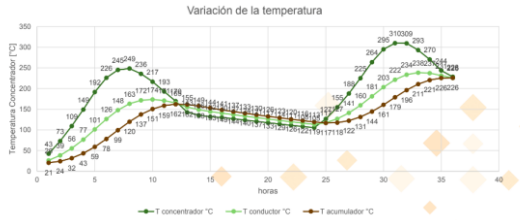










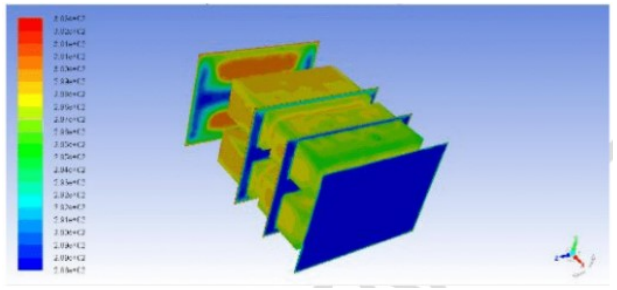


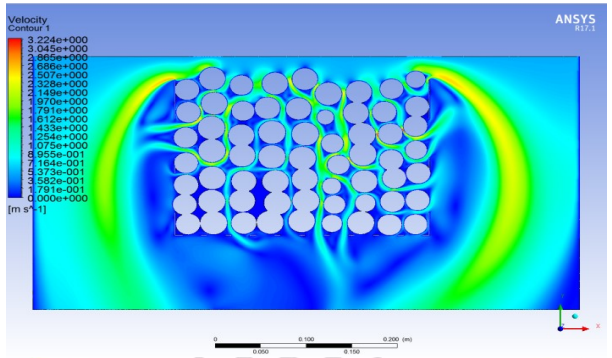
ChilledBIN

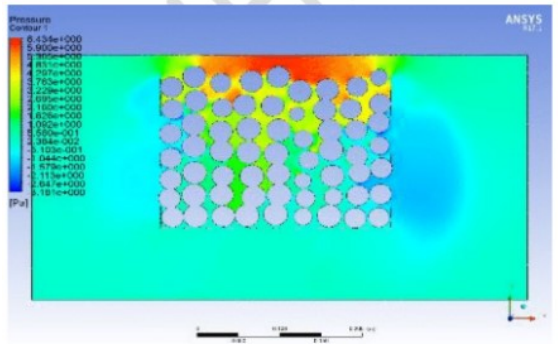
Project for develop a producto at prototype level to regulate autonomously and in the field the temperatura and humidity of fruits inside conventional Bins.

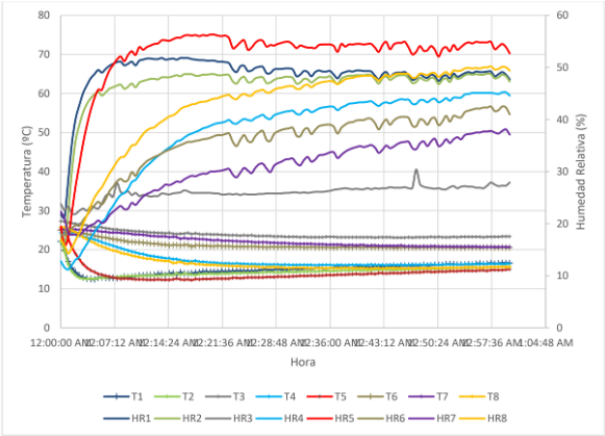
ChilledBIN technology seeks yo minimize these losses by conditioning the interior atmosphere of the Bins from the momento of harvest until they enter to the packing chambers. For this, a device consisting of a lid compatible with the different Bin on the market has been designed, capable of generating a cold and humid air Flow that, under design conditions, manages to keep the temperatura below 20°C and relative humidity above 80%, practically all day.

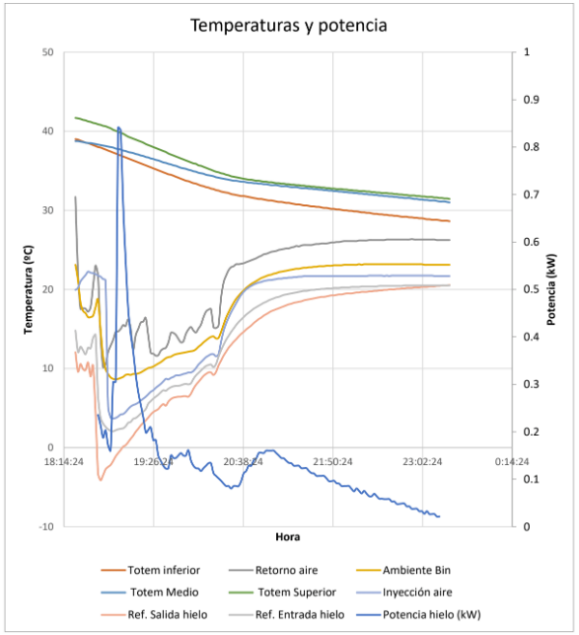
Client: Own development







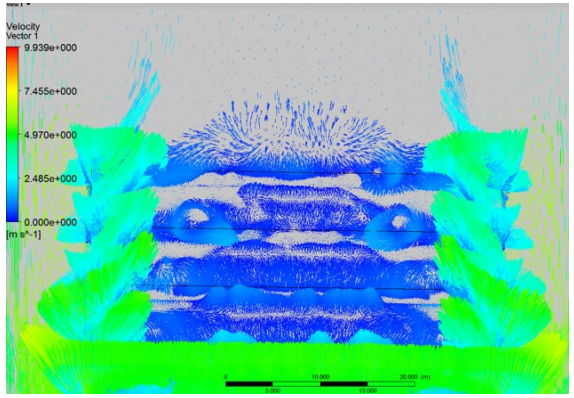


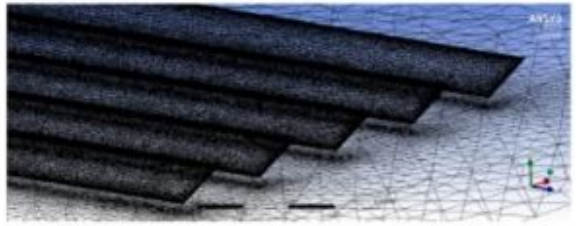


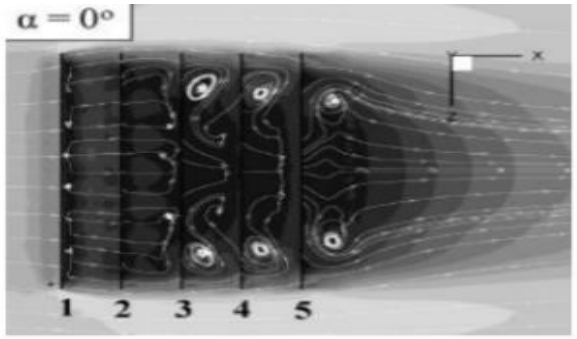
Study of the Effect of Thermal Interaction on the Performance of an Arrangement of Photovoltaic Modules

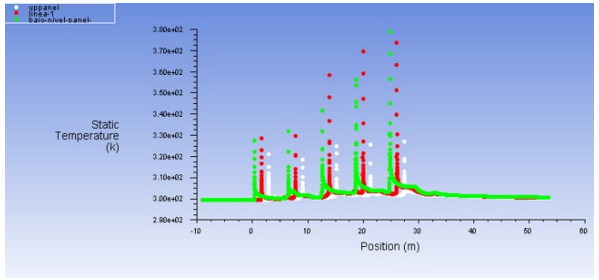
Simulations were performed for three wind speed profiles, wich were programmed using UDFs and four inclination angles. Cfd models were validated based on literature, specifically on lift and drag coefficients. In addition to this, the influence of the heat Flow on a group of modules with the adjacent arrangements was evaluated, and this information was compared with the inclination geometric factor to define the weight of these variables in temperaturas and generate a mathematical model.

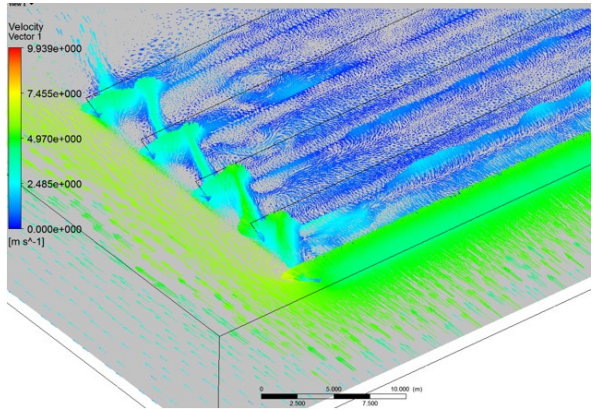
Client: Own development

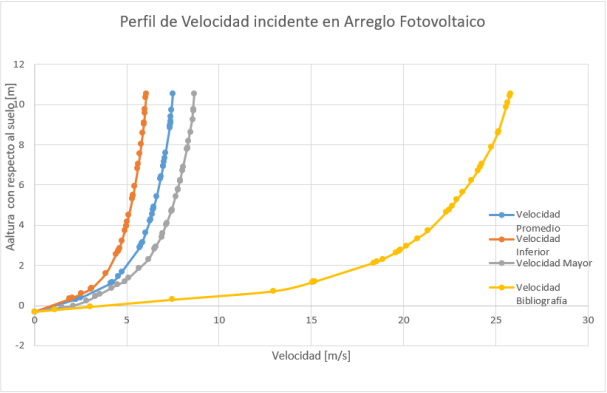












INTERNATIONAL CONGRESSES PUBLICATIONS

Hydroprocess2019

Hydroprocess 2019

International Seminar on process hydrometallurgy

ANSYS & TRNSYS analysis applied to BARRIER BALL® a thermal and evaporation barrier for water or PLS

Water and energy management in Hydrometallurgy is a fundamental challenge for the sustainable development of mining operations. Barrier Ball® presents a double solution to the problems of evaporation and energy in free water or pregnant leach solutions (PLS) ponds. This system is an evaporation and heat transfer barrier based on semi-submerged spheres placed on the surface of the water which cover approximately 90% of the air-liquid heat and mass transfer area. Regarding to previous experimental tests this system saves 80-90% of evaporated water compared to a free water or PLS surface. In addition, this barrier, significantly reduces thermal losses, reducing the freezing risk in high altitude water ponds and reduces energy consumption in the case of heated industrial PLS ponds.
To analyze and improve product specifications several studies using the transient simulation software, TRNSYS, and Computational Fluid Dynamics (CDF) analysis through ANSYS Fluent have been performed.

A general thermal and evaporation model developed in TRNSYS for free water surfaces evaluates evaporation and thermal behavior of water ponds in different climates (altitudes, wind conditions, radiation) and water temperatures.

On the other hand, CDF ANSYS Fluent analysis have been developed to settle further developments:
• CDF ANSYS Fluent wind effect analysis for large free water surfaces and wind-interaction analysis with the ground. Monitoring results confirm general behavior of this model.
• CDF ANSYS AIM wind – sphere interaction analysis to evaluate the stacking effect of wind on Barrier Ball arrays in large surfaces.

EXMAJET. An innovative non-interfering aeration system for high-current density EW processes

The conventional Copper EW electrowinning (EW) process is characterized by a higher specific energy consumption than the theoretically required (2000 to 3000 kWh/MT Cu versus the theoretical 750 kWh/MT Cu) and a production of cathodes of inferior physical and chemical quality with respect to electrorefining. Therefore, the optimization of energy consumption for EW processes and/or improving the quality of cathodes is fundamental for the long-term sustainability of mining.

Improvements in energy efficiency have been achieved through the development of high current densities in EW processes. The limiting current density depends on boundary thickness and the diffusion coefficient, which both in turn are determined by the properties and agitation of electrolytes.
One agitation alternative is EXMAJET®, a hydrodynamic turbulence generator for high-current density EW processes, which operates via a biphasic flow air-electrolyte. EXMAJET has been previously tested in several tank-houses with positive results. Nonetheless, the design has recently been optimized to improve its kinetic turbulence characteristics throughout the EW cell, to achieve a more homogeneous turbulence distribution.

To analyze hydrodynamic turbulence, CFD ANSYS Fluent simulations were developed. Initially, fluid dynamic characterization of the formation of biphasic electrolyte and air turbulent flow inside the jet were simulated and subsequently optimized. Furthermore, jet dimension, and aeration and pressure loss were optimized too. All these CFD ANSYS Fluent simulations were validated in experiments performed in a mini-cell test center specifically designed for that purpose.
Secondly, a complete cell fluid dynamic characterization analysis was performed in CFD ANSYS Fluent to visualize turbulence and kinetic energy distribution throughout cell.