

# CERN-GREECE INDUSTRY DAY 2014




Outsourcing Engineering & Consulting Company

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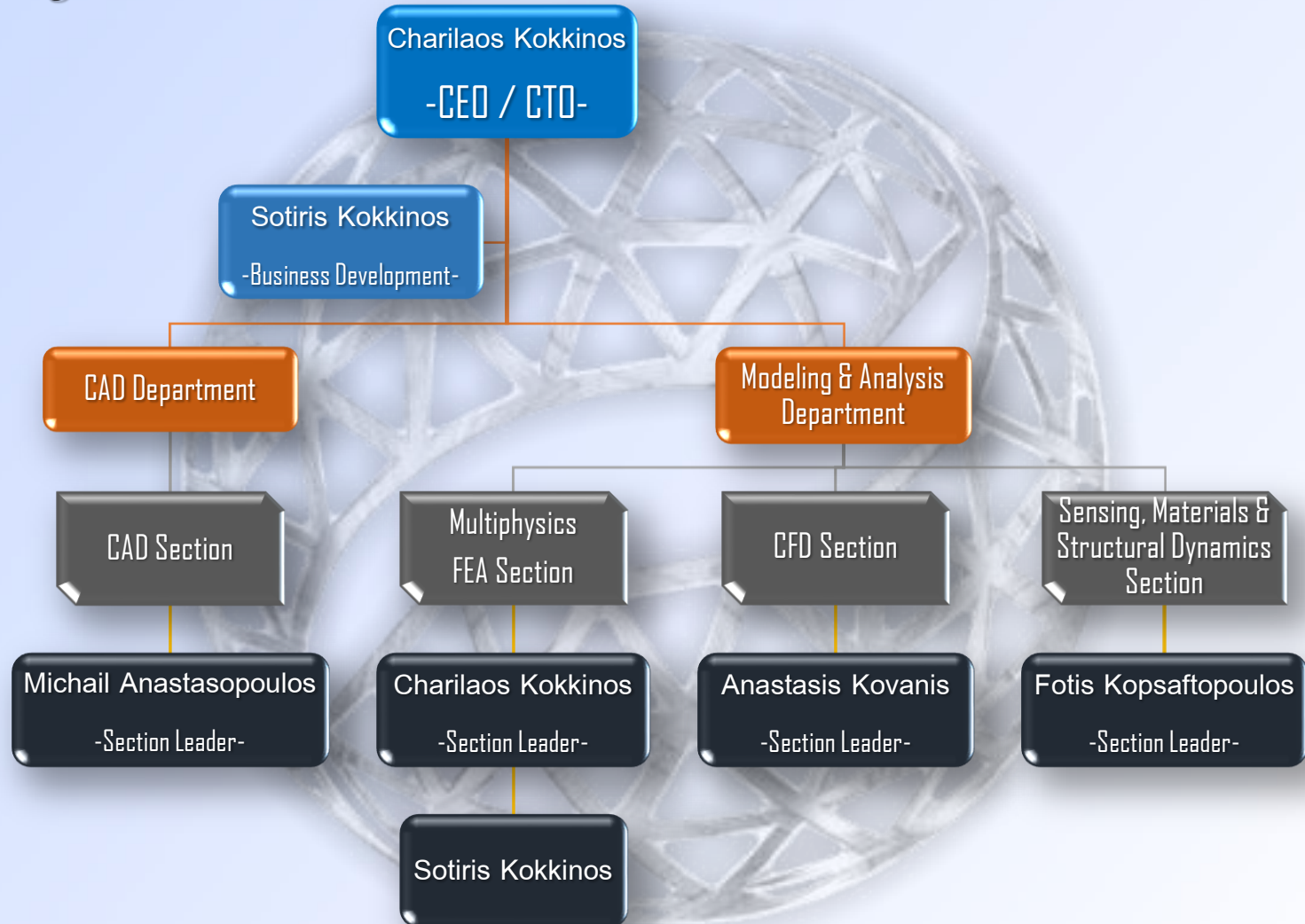
- ❑ **FEAC** is a start-up engineering company
- ❑ We focus on *simulation driven product development* with advanced engineering simulation techniques and by using the best-in-class Computer Aided Engineering (CAE) tools
- ❑ We act either as an outsourcing consultancy or as an independent engineering company
- ❑ We provide services from product concept design and CAD drafting to advanced multiphysics Finite Element Analysis and structural health monitoring
- ❑ **FEAC** operates to both the Greek and the global market.







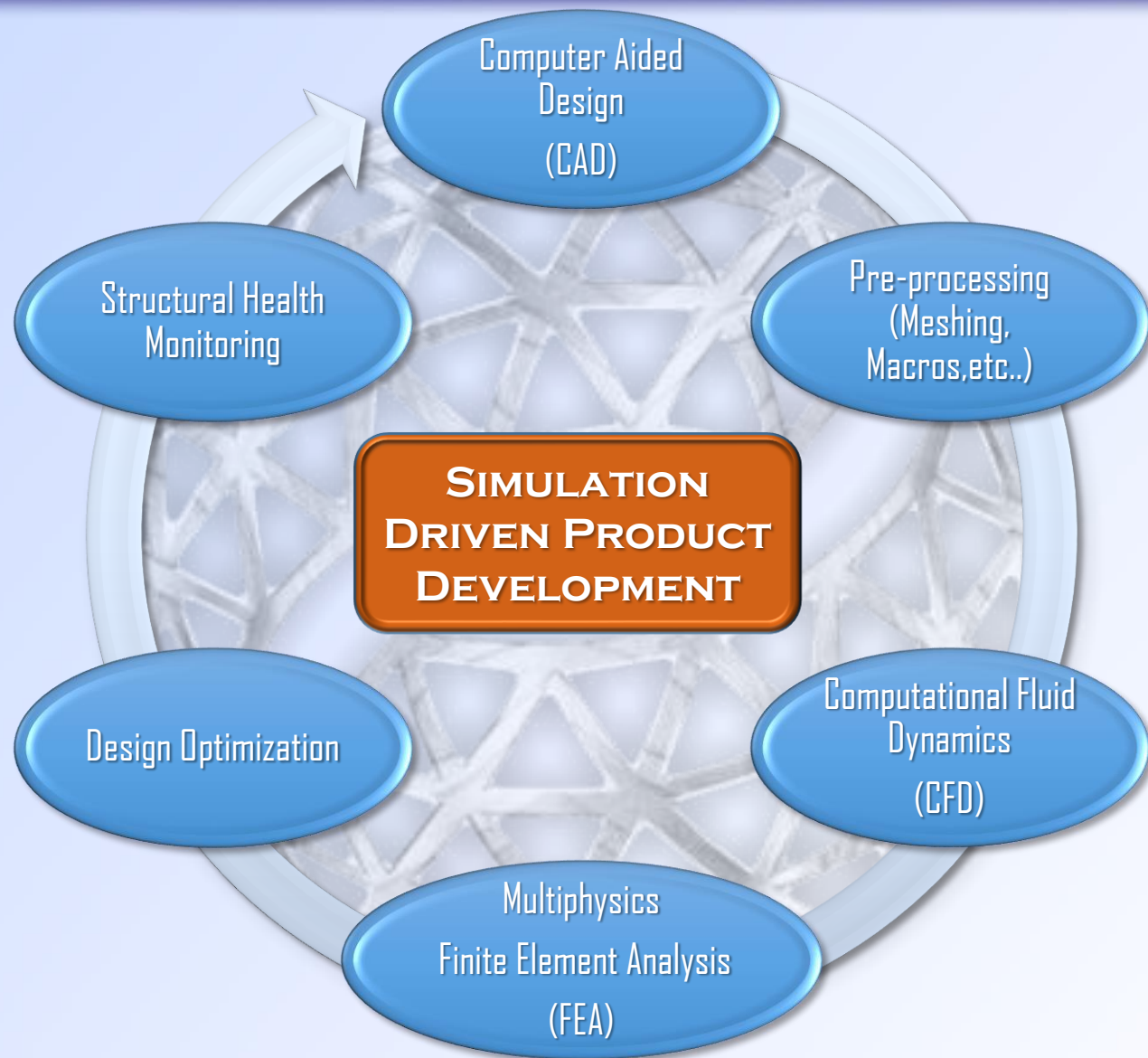
## ➤ Organization Chart



About Us  
Our Services  
Projects  
Competitiveness  
Collaboration



# OUR SERVICES

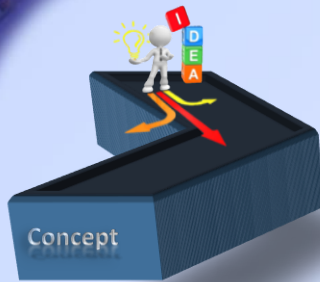


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# OUR SERVICES

## PROJECT WORKFLOW



### Brainstorming

new & innovative  
ideas

### Example:

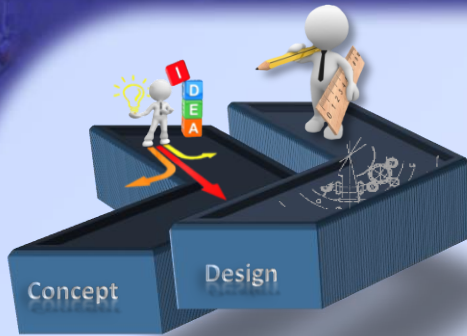
Need to validate the procedures for the construction of more powerful superconducting magnets with high performance conductor for the Large Hadron Collider (LHC) and future accelerators.

What about a project aimed at designing, manufacturing and testing Nb<sub>3</sub>Sn coils in a dipole configuration?



# OUR SERVICES

## PROJECT WORKFLOW



### CAD Services include:

- Concept design
- Parametric 2D / 3D Part Design
- Parametric 2D / 3D Surface Design
- Parametric Assembly Design
- Geometric dimensioning and tolerancing
- Manufacturing drawings
- Rendering
- Paper to CAD conversion
- 2D to 3D design translation (and vice versa)

### Example:

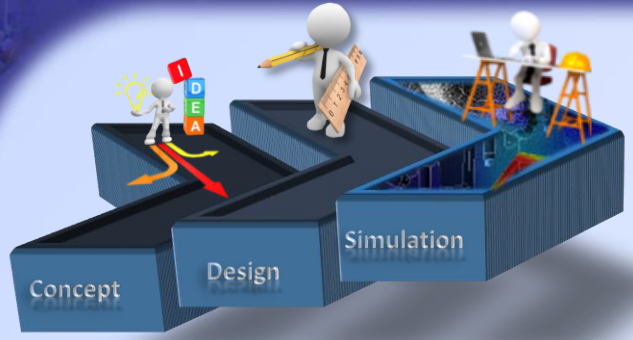
#### Example:

Need to validate the procedures for the construction of more powerful superconducting magnets with high performance conductor for the Large Hadron Collider (LHC) and future accelerators.

What about a project aimed at designing, manufacturing and testing Nb<sub>3</sub>Sn racetrack subscale coils in a dipole configuration?

# OUR SERVICES

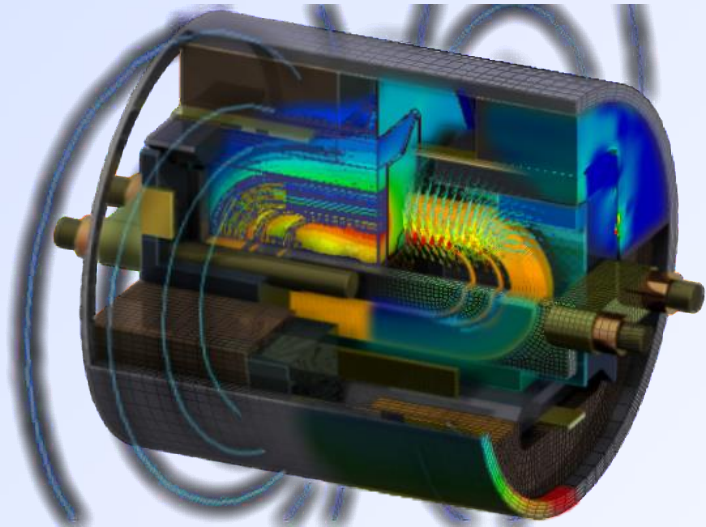
## PROJECT WORKFLOW



### FEA Services include:

- Meshing
- Structural Analysis
- Electromagnetic Analysis
- Thermal Analysis
- Modal Analysis
- Coupled Multiphysics Analysis
- Computational Fluid Dynamics (CFD)
- Optimization

### Example:

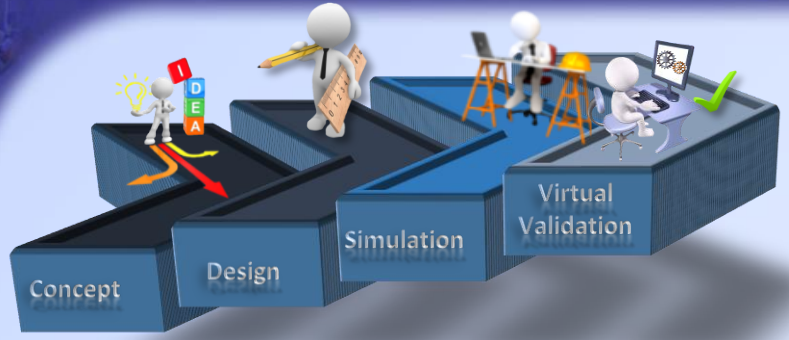


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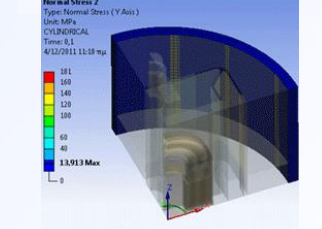
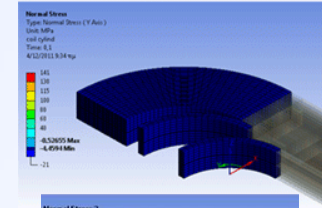
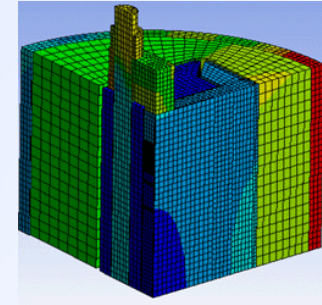
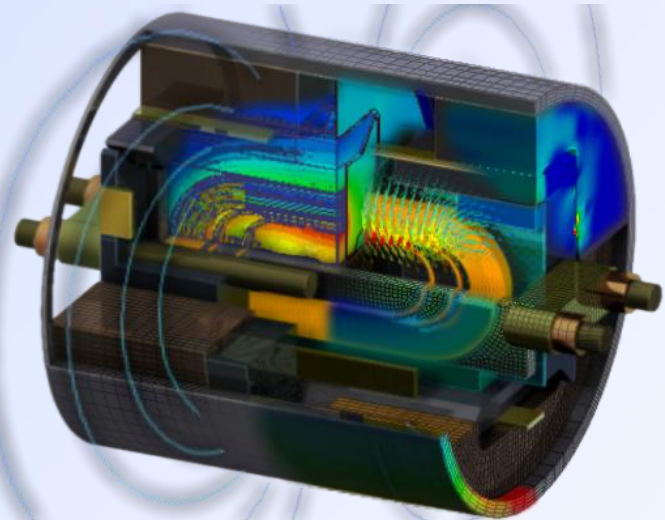
# OUR SERVICES PROJECT WORKFLOW



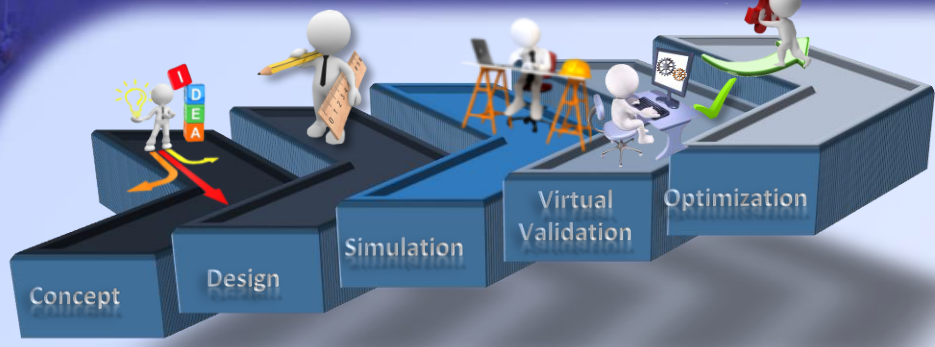
Check  
if the results fulfill our  
requirements

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Example:



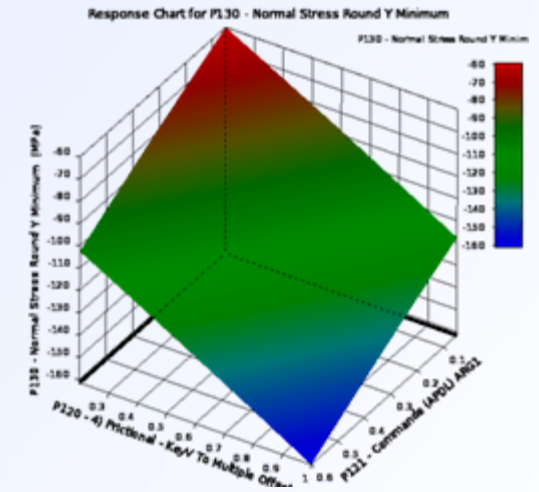
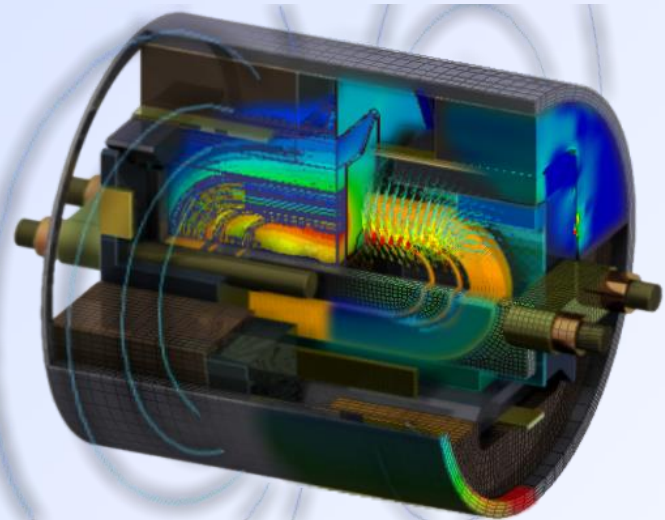
# OUR SERVICES PROJECT WORKFLOW



Optimized design  
after simulating hundreds of  
“what-if” scenarios

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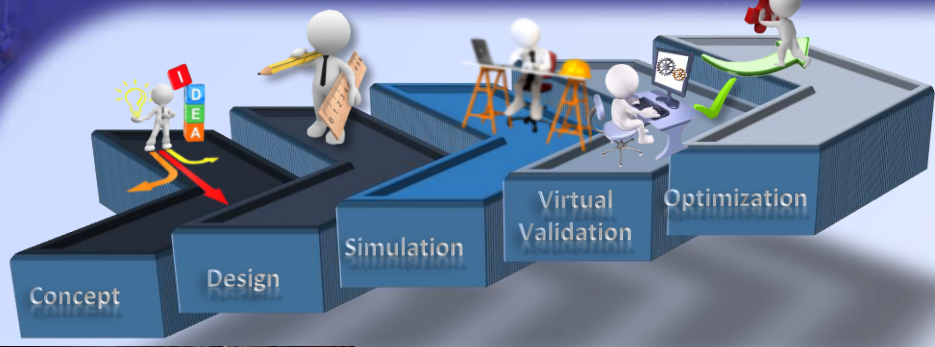
Example:



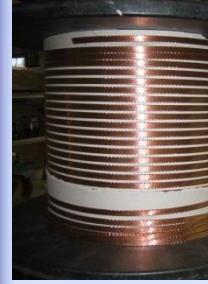


# OUR SERVICES

## PROJECT WORKFLOW

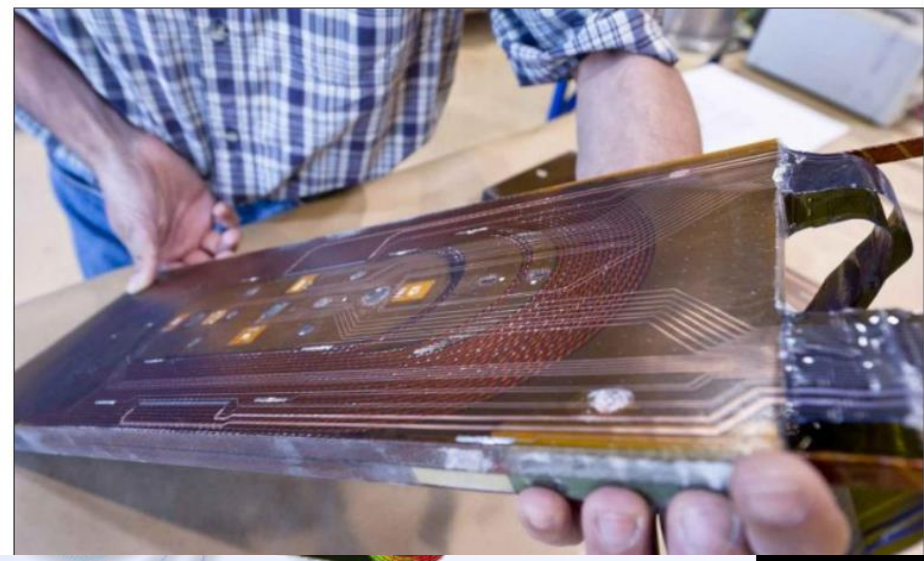


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Example:

*Sarah Charley*

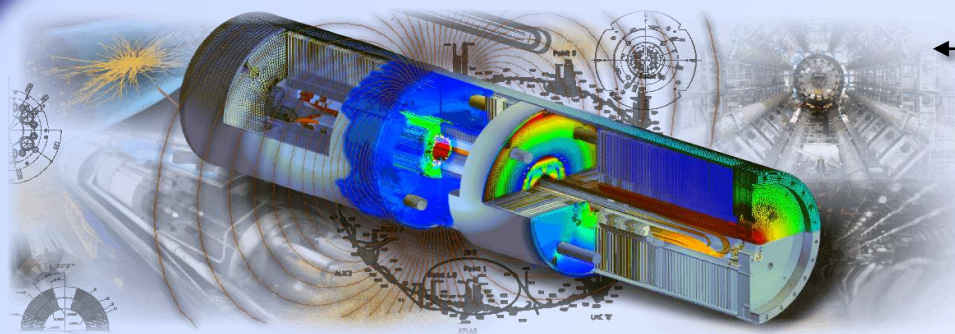




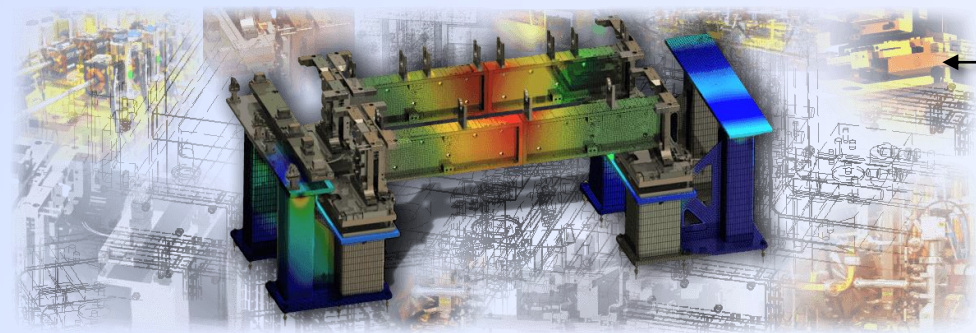
# SOME OF OUR PROJECTS



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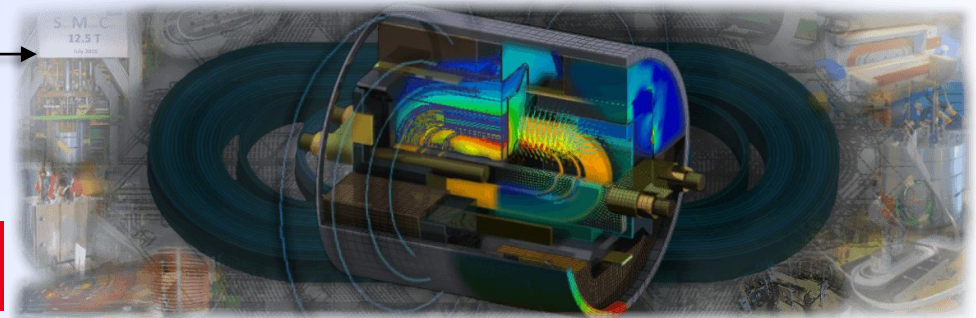
← **IIT superconducting accelerator dipole magnet**  
for the High Luminosity upgrade of the LHC  
(Large Hadron Collider)



← **High precision test bench**  
for the necessary alignment of complex machines



← **Short Model Coil**  
aims at designing, manufacturing and testing  
Nb3Sn racetrack subscale coils in a dipole  
configuration (CERN magnetic field record)





# COMPETITIVENESS



**ANSYS**<sup>®</sup>  
— 2014 —  
**HALL OF FAME  
COMPETITION**

**COMPETITION WINNER  
BEST IN CLASS: CORPORATE**

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INTERNATIONAL JOURNAL OF HIGH-ENERGY PHYSICS  
VOLUME 52 NUMBER 1 JANUARY/FEBRUARY 2017

**ADVANTAGE**  
EXCELLENCE IN ENGINEERING SIMULATION  
VOLUME 1 ISSUE 3 2017

**All eyes are on the Higgs**

**HEATING THINGS UP IN THE GLASS INDUSTRY**  
PAGE 8

**OUTREACH**  
Building a machine  
with APDL macros  
that's 100% reliable  
p43

**THE ARTS**  
Collaborating  
with artists  
to create  
p38

**A BEAUTIFUL FUTURE**  
Points for Success  
and Support p21 & p26

transferred to ANSYS Workbench. All necessary boolean/body operations and  
metric analysis in was run in Emag (3-D) and ANSYS Maxwell (2-D and 3-D) to  
on setups and algorithms. The same parameters are shared, in terms of current  
excitation, geometry, number of strands and turns.

APDL macros were used to transfer Lorentz forces from Emag to the structural analysis. In ANSYS Maxwell, the Lorentz forces were transferred in the  
structural analysis as body force densities via the direct linkage between the two analyses.

Since the operational temperature of the superconducting accelerator magnet is at 1.9 K, ANSYS Mechanical was used to conduct the 2-D and 3-D  
thermal and structural analysis, along with APDL macros. DesignXplorer was used to explore the design space. The whole design was optimized.

During the assembly phase of the structure, tests at cryo temperature and powering tests, the results from the FE Analysis were compared with the  
strain gauges values derived from the data acquisition systems and proved to have excellent correlation.

**Business Benefit**



- Alignment systems
- Normal & Superconductive magnets
- Magnetic Analysis of detectors
- Cryogenics





THANK YOU!



Outsourcing Engineering & Consulting Company

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Visualize, Simulate, Optimize and Realize your Ideas

