

3DCS technology is helping ITER optimize design and assembly of Fusion Plant in Cadarache, France

ITER successfully implements the use of 3DCS Dimensional Tolerance Simulation in the design and assembly of ITER Fusion Plant.

Troy, MI USA, USA--(BUSINESS WIRE)— February 2009—Dimensional Control Systems, Inc. (DCS), a Dassault Systemes Premier CAA V5 Gold Software Partner for Tolerance Analysis announced the successful implementation of 3DCS Catia V5 Based software with the design of the ITER Fusion Reactor. 3DCS CAA V5 is a state of the art Dimensional Tolerance Analysis Software Solution fully embedded inside of Catia V5. This is believed to be the “first ever” application of tolerance analysis for this type of product.

Dimensional Control Systems was contracted by ITER to dimensionally assess several aspects of a Fusion Plant in Cadarache, France. For over eight months the DCS Team has meticulously created 3DCS CAA V5 Based Tolerance Analysis Models representative of the design and manufacturing processes of the ITER plant. The mission set forth to DCS by ITER is clear: to streamline selective dimensional aspects of the product and assure that all components assembled the first time, without the need for rework or modification whatsoever.

What is ITER? ITER is a joint international research and development project that aims to demonstrate the scientific and technical feasibility of fusion power. The partners in the ITER Project are the European Union (represented by EURATOM), Japan, the People’s Republic of China, India, the Republic of Korea, the Russian Federation and the USA. ITER will be constructed in Europe, at Cadarache in the south of France. In the core of ITER, a mixture of two hydrogen Isotopes (Deuterium and Tritium) will be heated up and compressed by means of large magnetic fields, at the condition similar to those necessary to operate a fusion powered electricity production plant. ITER’s Fusion Reactor requires complex engineering – and holds many new and emergent technologies. The construction of ITER has started and many components are in the early phase of production.

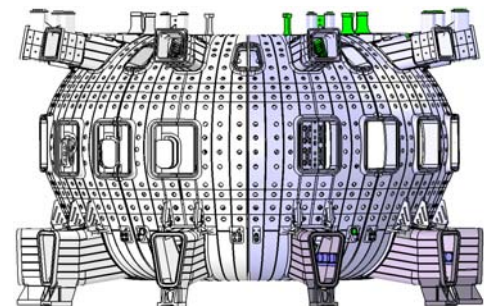
“The complexity in assembling a fusion plant necessitates an intricate assembly process”, states Bob Kaphengst – President and CEO of Dimensional Control Systems. Mr. Kaphengst also credited the “robustness” of the tool for being able to handle many non traditional assembly methods. Many of the investigative dimensional measurements implemented by Dimensional Control Systems have been rather “classic” from a modeling point of view (gap, step, distance variation, hole misalignment, etc.). However - the assembly process required significant modeling complexity, which was handled fairly easily utilizing the robust capabilities of 3DCS such as the ability to model multistage assemblies, pin-ability, hole winking, collision detection, etc.

The area targeted by ITER of significant dimensional concern is at the vacuum vessel of the plant, which resembles a “nine-slice” orange. This vacuum vessel is assembled in a complicated and rigorous procedure, ultimately forming the “complete orange.”

3DCS tolerance models were constructed to analyze these “slices” of the vacuum vessel which require extremely strict tolerances for successful assembly, and minimized custom machining and welding. 3DCS tolerance modeling is being used to validate a complicated plumbing system, and most importantly, assembly of internal components of required material thickness to endure the extreme heat and pressures involved.

Some of the key requirements of the vacuum vessel being analyzed are:

1. Alignment of Sectors (slices) in radial and vertical directions.
2. Gap variation between Sectors in toroidal direction.
3. Alignment of TF Coils in radial and vertical directions.
4. Gap variation between TF Coils in toroidal direction.
5. Gap variation between Ports and Port Plugs in toroidal and vertical direction



ITER Vacuum Vessel

All of the assembly processes have been seamlessly replicated in the 3DCS tolerance model. The method of model development and input from supporting ITER Engineers revealed that not all aspects of the design and assembly methodology were completely thought out. It is common that the process of creating a 3DCS Tolerance Analysis Model will identify design and manufacturing conflicts. Additionally, engineers who were relying on simple linear stack tolerance calculations were surprised to see the potential issues through the use of 3DCS. The "continuous deviation" function of 3DCS is helping ITER engineers to understand with confidence potential failures.



Outer coil being lowered into cryostat

3DCS modeling is also supporting ITER in the realistic establishment of tolerance requirements with respect to function, performance, and cost. The initial results of the 3DCS model were the foundation for the re-evaluation of the initial requirements. It's apparent that the use of 3DCS and tolerance modeling is supporting ITER re-evaluating the design and manufacturing processes as originally strategized. The up-front 3DCS analysis is proving to be undeniably beneficial early enough in the project where changes can be made with no negative effect on cost or timing. The cost and time saved by these early changes can be assumed to be significant.

It's worth noting that many variation results are validating measurement outputs within the expected range of variation. ITER is taking advantage of this data to relax the associated tolerances and requirements. Additionally, confidence is being gained allowing the effected engineering teams to concentrate on other areas needing greater attention.

The use of 3DCS at ITER is producing many positive influences to the design and assembly process. The level of "trust" in the results produced by 3DCS is growing quickly through the organization.

"ITER is now finding that many of its engineers now prefer to wait for analysis results before their "next move" as the data helps to "drive

the decision making process" noted Jens Reich of ITER. Our thanks go out to Jean-Jacques Cordier and Jens Reich for being the key people within ITER who sought the use of Tolerance Analysis as a part of the baseline engineering process efforts.

About Dimensional Control Systems Inc. (DCS)

DCS is a world-class provider of Dimensional Engineering Consulting Services and Software Solutions. DCS is a trusted source of highly acclaimed 3-D tolerance analysis technology. DCS has been successfully supplying organizations worldwide with full-service, "turnkey" Dimensional Quality Solutions. *1DCS, DCS-DFC, 3DCS, 3DCS CAA V5 Based for CATIA V5, 3DCS FEA Compliant Modeler, 3DCS Advanced Analyzer/Optimizer GDM-3D, GDM-Web, and DataGrabber* are all trademarks of Dimensional Control Systems, Inc.

About ITER

ITER will be the world's largest experimental facility to demonstrate the scientific and technical feasibility of fusion power. Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together to form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a prototype fusion power plant that is safe and reliable, environmentally responsible and economically viable, with abundant and widespread fuel resources. The ITER project is sited at Cadarache in the South of France. The construction costs of the facility are estimated at 5 billion Euros over ten years, most of which will be awarded in the form of contracts to industrial companies and fusion research institutions. Europe will contribute roughly half of the costs of its construction, while the other six Parties to this joint international venture (China, Japan, India the Republic of Korea, the Russian Federation and the USA), will contribute equally to the rest. Each Party has set up a Domestic Agency to organize and carry out procurement of their in kind contributions to ITER. The Domestic Agencies employ their own staff and have their own budget and will place contracts with suppliers.

Information about DCS Inc. is available at <http://www.3dcs.com>

Information about ITER is available at <http://www.iter.org>

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