

# HE-ARC: Swiss Precision Brings Focus to the Very Large Telescope

The Haute Ecole Arc Ingénierie uses CATIA in the area of micromechanics for its research and development activities as well as in its engineering curriculum.

The Haute Ecole Arc Ingénierie in St-Imier, Le Locle and Delémont, Switzerland strengthened in 2006 its activities within the Dassault Systèmes PLM ecosystem by signing a partnership agreement thus becoming the unique DS-certified training center in Swiss Romandie for mechanical design and finite element analysis CATIA solutions. Transcat, a wholly owned subsidiary of Dassault Systèmes and Business Partner in Switzerland, is the local focal point for CATIA activity and works hand in hand with the Haute Ecole Arc Ingénierie for the transfer of technology know-how to industry groups in the Swiss region.

In addition, since February 2007, the Haute Ecole Arc Ingénierie became a Dassault Systèmes call center providing Swiss Romand customers with a unique entry point for all technical issues concerning the use of the CATIA and ENOVIA SmarTeam solutions.

## TECHNOLOGY KNOW-HOW IN MICROMECHANICS

The Haute Ecole specializes in micromechanics and focuses on two principal activities – teaching and research. As a University of Applied Sciences, and in addition to its professional training classes as a Dassault Systèmes certified training center, the Haute Ecole provides its students with an electrical, mechanical and micro-technology engineering curriculum in sync with the needs of the Swiss industrial sector such as the intricate design of watch mechanisms.

The school also has several research and development laboratories, managed by the same professors who teach at the school. Olivier Duvanel, professor at the Haute Ecole is responsible for the LaMIQ (Laboratoire de Métrologie et d'ingénierie de la Qualité) or Laboratory of Metrology and Quality Engineering. "80% of the university's activity is dedicated to teaching and 20% to research and development", said Mr. Duvanel. "Our teaching objective is to transfer our technology know-how to our students to help them acquire the competitive edge that will lead to exciting job possibilities as well as to companies in the region to help them develop their business", he adds.

In effect, the Haute Ecole's ambition is to be recognized as a reference for companies in Switzerland by turning out students with the appropriate skills that will fulfill their job requirements. The watch sector alone represents 40,000 jobs in the region and the Haute Ecole is the only university that proposes an educational program based on micro-technology.

## INCREASING THE PRECISION OF THE VERY LARGE TELESCOPE

In the area of R&D, one of the university's key research projects is the VLT or Very Large Telescope situated in Mount Paranal, Chile. The VLT is composed of four telescopes with a diameter of 8.2 m as well as several other

smaller telescopes. When the telescopes are paired they provide exceptionally sharp images, making it theoretically possible to see an astronaut on the moon's surface!

To be able to detect planets outside our solar system, two telescopes are used to simultaneously observe the same object. However, interferences due to environmental conditions such as temperature variations can provoke optical fluctuations. It is therefore necessary to reduce these fluctuations as much as possible. The task that LaMIQ has undertaken was to develop the portion of the telescope that manages interferometric metrology that is, the part that collects the laser beams and manages the interferences. The LaMIQ, in collaboration with the European Southern Observatory, is responsible for developing the metrology that will make it possible to simultaneously observe two stellar objects that are only 1 arc-minute apart. Olivier Duvanel comments, "Part of our mission was to develop a system capable of aligning

the telescope's mirrors with a precision of one arc-second". "This high precision work was accomplished using the CATIA solutions", he adds. For example, they used the finite element solutions for the flexible deploying arms and GAS and GPS for frequency constraint calculations.

The Haute-Ecole eventually deployed the CATIA solutions in 2004, after a few years of partial implementations at the different laboratories. Their choice was in part due to CATIA's intuitive graphic interface making it easy to learn as well as the ability of the CATIA solutions to cover their entire development process. For the VLT project, they used CATIA to develop their system with a precision on the order of a micron. They also

simulated, very early on, the way a part will function before actually going to production. They were sure the system would work as planned since they had virtually performed stress tests of the flexible deploying arms and this, without having to use expensive physical prototypes. "We rapidly realized that CATIA was perfectly adapted to the area of micromechanics and capable of modeling and simulating parts that are extremely precise and complex", said Olivier Duvanel.

**For more information:**  
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## Future directions

Their long term strategy focuses on developing specific skills able to cover the entire engineering process within the PLM philosophy. For example, a special one day training class for industrial customers will be held in October 2007, on the role and deployment of PLM in a company as well as on the use of CATIA and ENOVIA SmarTeam, based on practical case studies. Specific training classes for the watch industry with dedicated design techniques will be proposed as well.