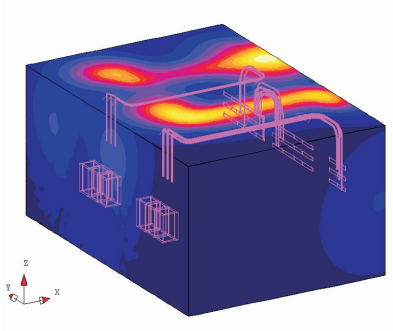
SUCCESS STORY

Romande Energie, Switzerland

Electric energy production, transmission and distribution company

Since February 2000, electric utilities in Switzerland are submitted to a new federal regulation based on the principle of precaution and limiting the electromagnetic fields radiated by their equipment.

Switching substations, underground cables and overhead lines are concerned: the maximum radiated flux density level should be limited to 1 micro Tesla in «sensitive areas» such as schools, hospitals, nurseries or houses.



Flux density on substation walls modelled with Flux 3D.

The Challenge

Romande Energie had to propose technical solutions in order to keep the radiated fields within the range set by the Swiss federal regulations.
Accurate description of the equipment, reliable electromagnetic fields computation and measurements of current installations were therefore required in order to identify and set in conformity equipments which were not respecting the federal norm on radiated fields.

Subsequent measures can consist in refurbishing, re-building or implementing additional electromagnetic shielding in order to reduce the radiated fields in nearby sensitive locations.

The Solution

"The use of the finite element software package FLUX proved decisive for the prediction of low frequency electromagnetic radiation due to electric equipment such as overhead lines, substations, underground cables or distribution boards" says Dr Nadia Nibbio, Technical Manager. It helped Romande Energie to:

- Optimise the configuration of components in existing substations,
- Find an optimum layout for cables connecting transformers and distribution boards in substations,
- Set optimum distribution rules for the phases in the HV lines,
- Assess and minimise magnetic fields radiated by mixed overhead lines (50Hz three phase system and 162/3 Hz railways single phase line on the same corridor),
- Account for the radiation fields when designing new electric equipment,
- Assess the efficiency of magnetic shieldings.

»» *Modelling:*

Flux provides features for radiated fields. Among them:

- Modelling of open boundary cases,
- Accurate computation of long distance radiated fields,
- Coupling to external circuits (account for the three phase coupling of transformers, load unbalance, voltage supply variation…),
- Shell regions for thin magnetic shieldings, transformers tanks and thin airgaps,
- Modelling of laminated non linear materials (magnetic circuit of transformers),

The Challenge

Limit the radiated electromagnetic fields to respect the new Swiss federal regulations.

The Solution

Simulations with Flux to predict low frequency electromagnetic radiation due to electric equipment.

The Results

Save costs for the design of new equipment and refurbish
Preserve environment

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« Flux proved to be a flexible and reliable numerical tool for the requirements of a utility company. »

Dr Nadia Nibbio
Technical Manager
Romande Energie

- Non meshed coils for an easy modelling of cables and distribution boards,
- Account for non linear properties of magnetic alloys in sinusoidal steady state operation.

In order to efficiently describe the geometry of electric systems consisting of distribution transformers, cables, switch boards, magnetic shieldings and other electric equipments, a set of parametrised Python files was created. These help describing the geometric and physical properties in a fast way. Components are defined by parameters included in text files and used to create a complete substation geometry within a few seconds.

Thanks to the new features of Flux V10, key results such as the magnetic field distribution in a sensitive area can be automatically visualised and recorded in an excel file for example.

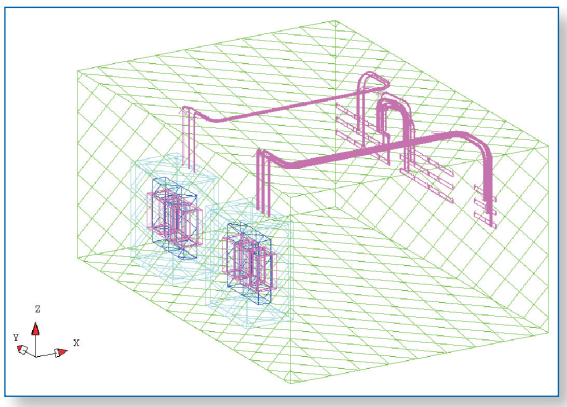
The Results

Reduction of costs

The use of Flux at an early stage of the design of their electric equipment allowed Romande Energie a large economical gain regarding the design of new equipment and refurbishing work.

Accuracy and reliability

Scientists obtained accurate results regarding the far field radiation prediction. Finite element modelling, with FLUX, helped focus on the main sources of electric pollution and limit the field emmission in sensitive areas such as schools, public gardens, hospitals and apartments.



MV-LV substation (2x 600 KVA, 535 A)

Romande Energie is now a leader among electric utility companies in terms of expertise in the design of substations and refurbishing of existing equipment.

Learn more about Romande Energie at:

http://www.romande-energie.ch

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