The project also includes three Siemens employees. In addition, Siemens BT developed the basic outlines of the project and contributed its knowledge of the market for control engineer-
ing in buildings.

Self-Sufficient Alpine Hut. A first impression of OptiControl will be provided by the Monte-Rosa Alpine Hut of the Swiss Alps Club (SAC), which will open on July 1, 2009. The hut is a joint project of ETH Zurich and SAC, with sup-
port coming from numerous sponsors and partners. The hut’s automation system is being supplied by Siemens. Since the hut will be lo-
cated at an altitude of 2,795 meters, it must be largely self-sufficient. Power will be supplied by a photovoltaic system supported when neces-
sary by a combined heat and power unit oper-
ated with liquefied petroleum gas.

OptiControl will be used to help manage the building. “For instance,” explains Tödtli, “when the battery and the wastewater tank are half full and sunshine is predicted in the near fu-
ture, the control system might initiate the wastewater purification process, which con-

Forecasts that Come Home

Regional weather forecasts are becoming increasingly detailed. Researchers in Switzerland hope to use this data to automatically optimize energy use in buildings while keeping costs to a minimum. Siemens engineers are providing practical help.

Siemens Building Technologies Division (Siemens BT) in Zug, near Zurich. “Our objec-
tive is maximum comfort with minimal energy costs,” says Dr. Jürg Tödtli, who manages the European research activities for heating, venti-
lation and climate-control products at Siemens BT. “Of course, before the project ends, we won’t know how beneficial weather forecasts are, but I see a major opportunity here.”

Since May 2007, about a dozen researchers and five institutions have been involved in OptiControl. In addition to Siemens, the latter include the Swiss Federal Office for Meteorol-
y and Climatology (MeteoSchweiz) in Zurich, the Research Institute for Materials Science and Technology (EMPA) in Dübendorf, and two in-
stitutes of the Swiss Federal Institute of Tech-
nology (ETH): the Automatic Control Labora-
tory and the Systems Ecology Group of the Institute for Integrative Biology.

Weather predictions and building automation will be tested in a pilot facility at 2,795 meters. Siemens researcher Dr. Jürg Tödtli (photo below) and partners are key players in the project.

The newOptiControl system, which is expected to be used for heating, ventilation, and air-
conditioning, window shutters and lighting. By mid-2008, a large-scale study will provide more numbers for hundred of differ-
tent scenarios and about a dozen locations — figures for one-room offices and for suites in Zurich, London, Vienna, and Marseille, for ex-
ample. The EMPA is contributing its expertise in building modeling. “In practical applications, the expense of installation and operation must be as low as possible,” says Thomas Frank, a Senior Scientist in the Building Technologies department. In this regard, one issue that must still be resolved is how simple the models can be while still achieving satisfactory operation of the control system. “Probably about a dozen parameters will be needed,” Frank estimates. “At least that can theoretically be calculated from the blueprint of the architect. What we still don’t have are standardized interfaces between the architect’s CAD programs and the building management software.”

Weather Data Via the Internet. Since early 2008, MeteoSchweiz has been using a weather model with a spatial resolution of 2.2 kilo-
bases. Based on ground-level grid squares with this edge length, 60 layers of the atmosphere are defined, and MeteoSchweiz’s computer cal-
culates the future weather for each cell. This makes local forecasts much more precise than previously, when the model had a grid resolu-
tion of seven kilometers. The “objective of saving energy is worth almost any amount of effort,” says Dr. Philippe Steiner, who oversees the development of models at MeteoSchweiz. The organization’s meteorologists provide infor-
mation on 24 weather parameters, each of which can predict conditions for three days on an hour-by-hour basis. The data includes tem-
peratures and information on wind speed and solar radiation. In the future, it will be transmit-
ted directly into buildings via the Internet.

“Processing the data to generate forecasts involves a huge amount of mathematical calcu-
lation,” says Professor Manfred Morari, head of the Automatic Control Laboratory of the ETH Zurich. “As it plans the next control command, OptiControl has to take into account the fact that more, as yet unknown information will be added in the form of new weather forecasts.”

For each additional step of advanced planning, the number of possibilities increases by a factor of ten to 100. The trick is to get a simple micro-
processor to perform these complex calcula-
tions. “OptiControl makes no sense if you need a supercomputer for it,” says Morari. “The issue of what the market will accept is essential.” This understanding of the customer’s needs is con-
tributed by Siemens, with its worldwide pres-
ence and many years of experience.

The OptiControl project will end in 2010, and its first products aren’t expected to appear before then. “Ultimately, the software could run in a small automation station on the wall,” pre-
dicts Tödtli. “No special PC will be required and the hardware for building control won’t be ex-
pensive either.” But plenty of work lies ahead. Field tests are taking place at Siemens BT’s labo-
atory in Zug. There, entire rooms are being set up to analyze the effects of a huge climate con-
trol system that generates artificial environ-
ment conditions. The scientists can thus measure how well a building control system re-
acts to fluctuating outside temperatures and how precisely it can adjust the required room climate. OptiControl will also have to demon-
strate its potential in that setting. “More than anything else, a good cost-benefit ratio is im-
portant,” says Tödtli.

Christian Buck

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