

Labs in the 21st Century - Towards a Green Campus

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For more than 13 years the International Institute for Sustainable Laboratories, abbreviated I²SL, has been organizing the Labs21 Conferences in cooperation with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). Main topics at these conferences are energy efficiency, protection of the environment and sustainability in the laboratory. Originally these conferences were intended for a rather small group of experts from U.S. government agencies. Since 1999 experts from the public and private sector are also welcome at these meetings. The architects Ralf Streckwall and Nils Bohn from the Construction Department of the MDC went to Rhode Island in September to participate in the 13th Labs21 conference and exchange ideas with colleagues from all over the world on topics such as the construction of new laboratories, retrofitting existing facilities to create Green Labs, and sustainable lab operations. They brought back a lot of new ideas for the MDC!

Flexible Lab Unit

Sustainability in the Lab

"Several years ago the U.S. government determined that it itself was the biggest operator of campus lab facilities and therefore had enormous energy costs," said Ralf Streckwall, head architect at the MDC. "At this conference it was especially exciting for us to see with what degree of intensity the topic of sustainability is pursued in the U.S. All American universities now have their own web page on this issue." Information and communication are crucial for the successful implementation of measures for a sustainable environment and climate protection. The conference participants therefore investigated the question of how laboratory staff can be better integrated into this process, made aware of energy issues and motivated to be more circumspect in their use of energy.

In her talk at the Labs21 conference, Dr. Kathy Ramirez-Aguilar, Green Labs manager from the University of Colorado at Boulder, showed how in Boulder the lab staff is reminded daily to keep the fume hoods closed as much as possible during lab work. They are also encouraged to close them entirely at the end of the work day and thus to actively contribute to saving energy. Besides stickers on the sash of the fume hood, energy saving sash height stickers are used in Boulder on the sides of the fume hoods, and that with some success. In Boulder there are eco-managers whose task is to provide guidance on sustainable lab use to the research groups. In the hallways there are posters on energy consumption statistics and on ways to save energy to capture the attention of the staff. New staff and students must attend a one-hour orientation session in which the basic principles of how a lab room functions are explained along with the different connections to electricity, gas and water. Reducing energy consumption is also stressed. In a kind of contest, such as the so-called freezer contest, the universities compete with each other to determine what temperatures



Lobby of the David H. Koch Institute for Integrative Cancer Research at MIT, Cambridge, MA, USA

are really required to store samples. Prizes are even awarded for the photo of the most heavily iced freezer or the oldest stored unclaimed specimen.

"Fume hoods are an issue at the MDC as well," Ralf Streckwall said. "Our biggest energy guzzlers are freezers and fume hoods. However, a key to significant energy savings are the employees themselves." A modern lab fume hood exchanges about 200, 400 or 600 m³ air per hour, depending on whether the sash is closed, half closed or open. An air exchange of about 400 m³ per hour requires the same amount of energy as a single family home consumes in one year! Who is aware of this in the laboratory? If the fume hoods were closed on a regular basis, the average air exchange rates could be reduced significantly. "In other European countries the fume hoods in biological labs are set to run at an air exchange rate of 200 to a maximum of 400 m³ per hour, without risk to the employees there," Ralf Streckwall explained. "Furthermore, the exchanged air has to be heated in the winter and cooled in the summer."

Calculations for Building 27 have shown that by reducing the air exchange rates in the night (10:00 pm -6:00 am), on the weekends

and on holidays, around 34,000 euros per year could be saved. "The old fume hoods are problematic because these operate with fixed air exchange rates and are not adjustable," said Michael Arnold, head of the TFM operations division. "To achieve a permanent energy-efficient solution in the sense of a 'Green Lab', these should be replaced with new adjustable fume hoods."

Another important element to increase energy efficiency in lab operations would be to replace old freezers, because through their heat output they cause the room temperature to rise. The ambient air has to be transported through expensive ventilation systems and cooled. The TFM operations division has commissioned a cool water network in the cooling room in the annex of the Max Delbrück Building. It will be completed by the end of the year so that from 2012 on, freezers that are cooled with water can be used. If both energy-saving projects turn out well, all buildings will be gradually retrofitted. In new construction projects like the ERC, water-cooled appliances will be used from the very beginning.

Flexible Labs

Brown University and the EPA Ecology Division on Rhode Island opened their doors for the conference participants, enabling Ralf Streckwall and Nils Bohn to take a look behind the scenes. "The lab furniture we saw provides great flexibility for each workplace," Nils Bohn noted. "It was a simple modular system consisting of height-adjustable work surfaces and shelves, tables and wall cabinets. The basic construction consists of frame profiles, so that additions can be purchased easily and quickly. In the ERC we will use a similar laboratory furniture system. There we will also use glass walls to create small evaluation workplaces. These 'cubicles' can be easily integrated into the open-plan laboratory space. To optimize the working conditions, sound-absorbing ceiling tiles have been installed.

Focus on the 'Feel Good' Factor

This was not the first time the two have visited American laboratories. Their impression: The technical standards and the standard of the equipment and facilities are generally much lower than in Germany. In American labs you improvise more. "Germany is traditionally a country of engineers and plant construction, and our solutions are correspondingly sophisticated," Ralf Streckwall said. "But does everything have to be on such a high level? What does science really need? Where we have technicians running around on campus, in the U.S. gardeners take care of the surrounding premises. The focus is simply on other things. I have the impression that in the U.S. it is more a question of atmosphere, ambience, good food, than of perfection regarding technical parameters. The 'feel good' factor is of prime importance!"



Professor Klaus Rajewsky, who is in the process of moving from Harvard Medical School to the MDC, confirmed the impression of the two architects when they visited him in his Boston Open Lab. He stresses the great importance of communication in open-plan laboratories for research. In his opinion, the most important thing is not to have the latest in lab equipment but rather to have a social space to promote scientific inquiry.

Communication Islands to Promote Research

“Before going to Lab21, I was on Long Island at the Cold Spring Harbor Laboratory,” Ralf Streckwall said. “There I noticed that they use a lot of wood and that there are communication islands everywhere and shared kitchens. Good food is becoming increasingly important, and the focus is on local products from the surrounding area. Just how important these things are for the MDC is shown by the success of the new café in the foyer of the Max Delbrück Building. Since its opening on October 6, 2011 it is much frequented by the staff of the entire campus.”

Towards a Green Campus

The team led by Ralf Streckwall would like to go still further and develop guidelines for a sustainable Green Campus. “We have submitted a proposal to the Initiative and Networking Fund of the Helmholtz Association of German Research Centers,” Ralf Streckwall said. “The Board strongly supports the intention to assume a leadership role in the research community on this issue.” Key topics for the campus of the MDC are staff influence and motivation, the power supply and energy efficiency, and the urbanization, ‘concretization’ and ‘asphaltization’ of the campus



Flexible connections at the ceiling and wooden furniture in a flexible lab unit

through new buildings and parking places versus public transportation and the improvement of the infrastructure for bicycles. "But we are also looking at the cafeteria situation," he added. "Shouldn't a research center that is focused on health and the preservation of health also place special emphasis on healthy nutrition? We are quite willing to get involved in this issue and want to further implement the ideas of the Green Campus concept."

Laboratory buildings are an essential component of the campus system. For well over a year and a half the MDC has been a member in a working group of the German Association for Sustainable Building (DGNB), which has adapted the existing criteria catalogue for office buildings to research and laboratory buildings. Next year a pilot phase will be launched in cooperation with the DGNB and the Federal Ministry of Transport, Building and Urban Development, in which the new criteria catalogue will be applied. With our expertise and our new buildings we also provide support in this area.



Flexible connections to water or gas at the ceiling of the lab



Simple modular systems