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News Release

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Protecting the environment while drinking beer

TUM brewing engineers research energy savings in brewing process

A cool, freshly drawn beer – for many a person this is the greatest of pleasures. But, in fact, a bad conscience should haunt us when we drink beer as it is among the most energy-intensive foodstuffs during production. Brewing engineers from the Technische Universität München (TUM) are working hard to improve the energy balance of the amber beverage. They are looking into a new process combination that would allow energy savings of up to 20% during brewing. The Weihenstephan scientists will be exhibiting the heart of their energy-saving idea at the drinktec trade fair in Munich (14 – 19 September).

For over one hundred years one fundamental technical precept has applied to all breweries: You can't brew beer without a kettle. Only a mighty boil kettle is capable of generating the temperatures of 110 to 160 degrees centigrade required to boil down "crude beer," the so-called wort. This process consumes substantial amounts of energy: Almost half of the overall energy consumption of a classical brewery – 45 percent, to be exact – goes into wort processing. That is why engineers have been working on solutions to reduce heat and electricity consumption in brewing for years now. One approach was to use combined heat and power (CHP) stations, which are highly energy efficient and environmentally friendly due their cogeneration of power and heat. This technology, however, has proven to be unsuitable for breweries: CHP stations do indeed generate heat in addition to power, but only achieve temperatures up 90 degrees centigrade. Boiling down wort requires at least 110 degrees centigrade. To remedy this deficit, engineers from the Institute for Resource and Energy Technology at the TU München have been following a hot trail since August 2008: They have combined the CHP station with a so-called "zeolite storage system."

Such storage systems work thermo-chemically with zeolite spheres 2-3 mm in diameter. These porous pellets are made of silicate minerals and have excellent heat storage properties. One gram of zeolite has an internal surface of about 500 square meters. The pores absorb water to full saturation. When zeolite is heated, the spheres dry up – the storage system is charged. Once water is added again, the zeolite spheres release heat of up to 250 degrees centigrade. The brewing engineers at the TUM want to take advantage of this thermo-chemical principle to add on the missing 20 degrees to the 90 degrees centigrade from the CHP station of the brewery.

Technische Universität München **Corporate Communications Center** **80290 München** **www.tum.de**

Dr. Ulrich Marsch	Head of Corporate Communications	+49.89.289.22778	marsch@zv.tum.de
Jana Bodický M.A.	Media Relations	+49.8161.71.5403	bodicky@zv.tum.de

To this end, they intend to use an empty time slot in the production process. “At night a medium-sized brewery needs little energy,” says project leader Dr. Winfried Russ. “In this time we can feed unused heat from the CHP station into the zeolite storage system.” During the day, when high temperatures are required to boil the wort, additional heat can be fed into the overall system almost instantaneously with the “heat boosting” press of a button. This places resource-efficient, low-energy beer within drinkable reach.

The newly combined production chain works perfectly already in computer simulations, and practical tests are just getting under way. Researchers from the TU München, in collaboration with colleagues from the RWTH Aachen, have now, for the first time, set up a test station at Weihenstephan that uses the new equipment combination to simulate brewery processes. Winfried Russ is eager to see the results: “We already know that it will work. What we don’t know is just how much energy can be saved.” The researchers are counting on at least ten percent.

In a second step, the TUM engineers intend to model the energy balance of an entire brewery. The cleaning system, the brewing facilities, the fermenting room and storage cellar, as well as the bottling facilities will all be heated at only 90 degrees centigrade instead of using steam of up to 160 degrees. The researchers are counting on this, taken together with the additional waste heat utilization, to result in energy savings of altogether 20 percent. “This is more than the total savings from all energy efficiency measures taken in the brewing industry during the last ten years,” according to Russ. The experiment will have run its course by mid-2011. Both small and medium-sized breweries are eagerly awaiting the results: Potential takers are already showing interest in the pilot project that will follow.

It is reasonable to expect that in a few years we will be drinking real “energy-efficient beer” – and enjoying it with a green conscience. The underlying technology will be on display at the drinktec 2009 trade fair from 14 to 19 September, where the Weihenstephan researchers from the TU München will exhibit a model of the zeolite storage system. Please do visit us in hall A4 at the New Munich Trade Fair Centre in Riem, Booth 335, every day between 9 a.m. and 6 p.m.

Contact:
Outside lecturer Dr. Winfried Ruß
Chair of Energy and Resource Technology
Department of Thermal Processes
Technische Universität München
85350 Freising-Weihenstephan
Phone: 08161 / 71 – 38 65
Email: winfried.russ@wzw.tum.de

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Picture material:
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Background:
The research project “Development of a process combination for energy efficient heat supply of a brewery” is being subsidized with EUR 400,000 by the DBU - Deutsche Bundesstiftung Umwelt and is being implemented in close collaboration with the Brauereimaschinenfabrik und Apparatebauanstalt Kaspar Schulz, Bamberg. The project, conducted by the Institute for Resource and Energy Technology at the TU München together with colleagues from the Chair of Technical Thermodynamics at the RWTH Aachen, will run until August 2011.

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