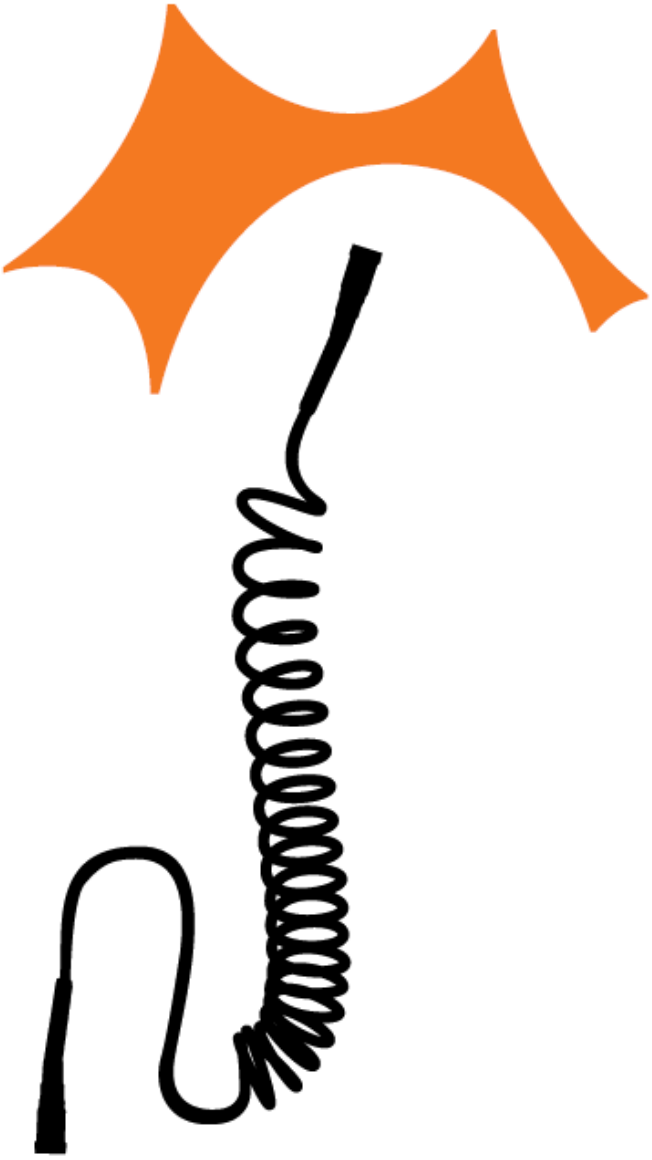


POWERED BY
DTU STUDENTS

Programme for DTU's TechLab where students talk about their projects. TechLab is situated to the right of the Arena stage.

Thursday open 5 p.m. – 8 p.m.

3D printers running

Friday open 12 noon – 6 p.m.

12 noon – 2 p.m.: CleanBean

2 p.m. – 4 p.m.: Piezo polymers

2 p.m. – 4 p.m.: Recycling of screws

4 p.m. – 6 p.m.: From a lake to cool beers

3D printers running all day

Saturday open 12 noon – 6 p.m.

12 noon – 2 p.m.: Hand hygiene

2 p.m. – 4 p.m.: Electric cars/power cable

2 p.m. – 4 p.m.: Explore RF app

4 p.m. – 6 p.m.: Solar cell-cooled beer

4 p.m. – 6 p.m.: Keep going, keep cold

3D printers running all day

Sunday open 12 noon – 6 p.m.

12 noon – 2 p.m.: PeeFence

2 p.m. – 4 p.m.: Wind turbine

4 p.m. – 6 p.m.: Cool By Human

3D printers running all day

DTU's journalists will be on site throughout the festival and can be contacted for further information about the projects:

Tore Vind Jensen, +45 3026 7710 / tovi@adm.dtu.dk
Christina Tækker, +45 2489 8388 / chrit@adm.dtu.dk

Got a grip on hygiene?

Good hand hygiene reduces the risk of infection. Therefore it's an important issue—also at Roskilde Festival. This experiment will show how important the positioning of alcohol hand rub is in the toilet area, and suggests how hand hygiene can be optimized at Roskilde Festival on the basis of concrete test results.

The project tests how festival-goers should apply alcohol hand rub to their hands correctly for best results, and which bacteria flourish in the camping area. Experiments will also show who carries most bacteria—the girls or the boys?

The first test involves conducting two parallel experiments:
1) One where you apply alcohol hand rub in the toilet by using one of the fixed dispensers ...
2) And one where you apply the hand rub outside the toilet after having first rinsed your hands in water.

In both experiments, all test persons have to place a fingerprint on a slide before using the toilet, and again once they have finished.

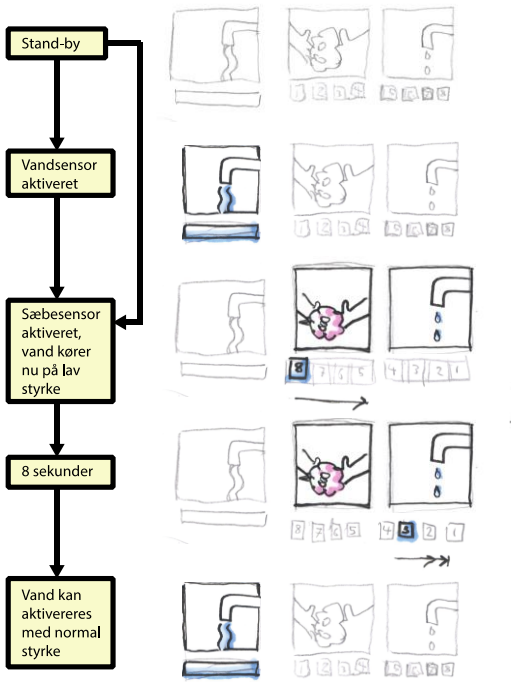
The test results may lead to lower rates of illness and infection, benefiting festival-goers and thus the festival in general.

TechLab showcase Saturday 12-14.

Most of us wash our hands incorrectly ... (CleanBean)

With sensor-controlled water, soap and pictograms, CleanBean is intended to change the behaviour of Roskilde Festival-goers by encouraging them to spend at least 8 sec. soaping their hands, a measure which can potentially cut the number of bacteria by approx. 75 per cent.

Did you know that WHO recommends soaping your hands for at least 20 sec. when washing your hands for optimum sanitization? CleanBean is an intelligent hand wash unit with a built-in soap dispenser which is designed to change users' behaviour so they wash their hands more thoroughly. The DTU students will ask all festival-goers to soap their hands for at least 8 sec.—a user-friendly compromise



After the festival-goer has activated the soap, the water will not flow at normal speed until the 8 sec. have elapsed. If they try to activate the water before the time is up, only a very small quantity will come out of the tap.

Initially, CleanBean will be tested at Roskilde Festival to learn more about user response, but we hope that the product can be installed at educational institutions such as high schools, technical colleges and elementary schools. By instilling good hand-washing habits in young people, the product may reduce the number of days they are off sick later in life.

TechLab showcase Friday 12 noon – 2 p.m.

Used frying oil can power Arena

Empty a deep-fat fryer including any residual chips and chicken legs into a generator to produce electricity to power the Arena stage! This is an idea which harnesses the best of two worlds: Recycling oil from the food stalls which they would otherwise have to dispose of—while at the same time generating electricity.

The deep fryer oil generator ECO_2 produces enough electricity to recharge 1,000 iPhones in an hour. And all it requires is 1.8 litres of frying oil. With all the frying oil which is used at Roskilde Festival you could generate enough electricity to power the entire Arena!

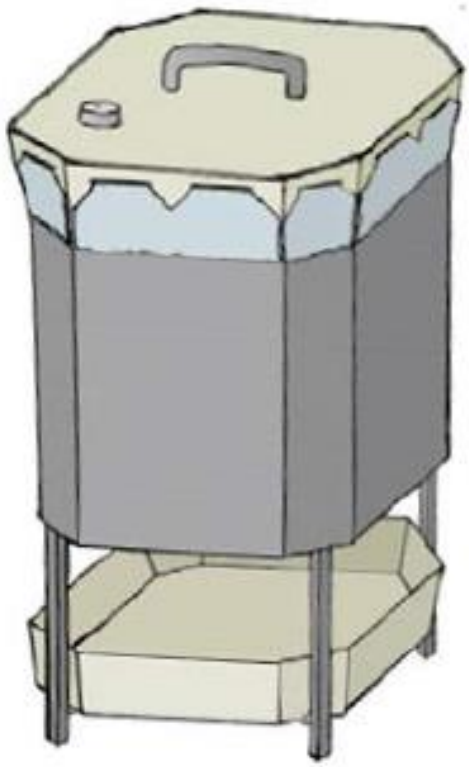
ECO_2 is a rebuilt diesel generator which can run on used deep frying oil. Thanks to the ingenious filter developed by students, you can pour the dirtiest frying oil including chip and chicken remnants through the filter which transforms the oil into a clean fuel that can be used to run the generator.

The original idea for the generator was conceived back in 2010. This is now the fourth time that the generator has been used at the festival. The generator will supply power to TechLab, where there are fridges and computers. It will also be used to recharge mobile phones, show football matches on projectors, play loud music and recharge lead-acid batteries.

Keep going, keep cold

This project is designed to tackle the problem of campers' lukewarm cans of beer while cooling our own and other people's beer by means of evaporation.

Hold Ud, Hold Kold (keep going, keep cold) is an innovative and astonishing way of cooling liquids with the potential of becoming the best technical innovation at the festival and an inspiration for all age groups. At the same time, we see huge potential in using evaporation as a method of cooling.



The project is a further development of the Hold Kold (keep cold) concept from a BSc project handed in last summer by two innovative students. We know that this is a realizable project which holds considerable potential.

In addition to the fact that such a functional and eco-friendly cooling system will be able to help quench the thirst of people all over the world by supplying them with chilled drinks, the cooling can also be used to protect foods from deterioration and dangerous bacteria.

TechLab showcase Saturday 4 p.m. – 6 p.m.

From lukewarm to fridge-cold canned beer on an exercise bike (Cool by Human)

Two minutes of pedalling can guarantee festival-goers cool canned beer at 5°C , even though the temperature of the beer was 30°C at the outset. How quickly can you cycle?

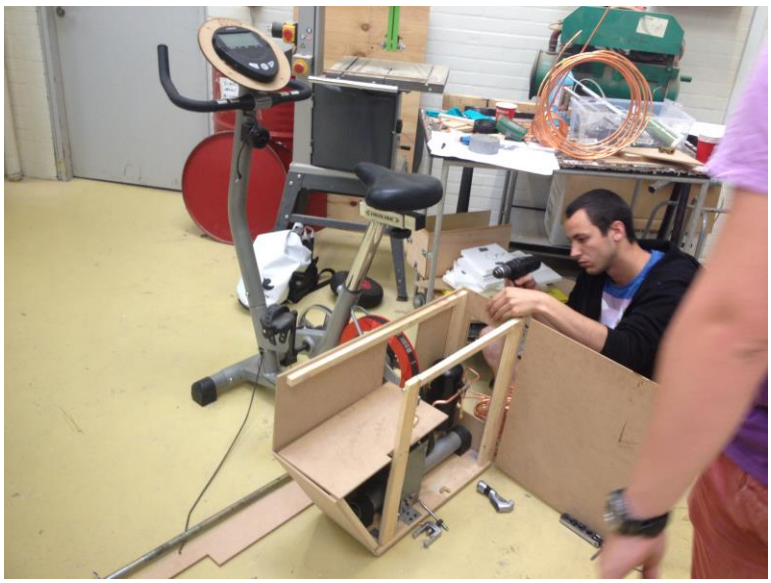
Reduce the temperature of your beer while your own pulse and body temperature increase—slightly. This is the concept behind Cool by Human, which asks festival-goers to work a bit in exchange for a cold beer. Pump the pedals for two minutes, and your beer will be cooled down to fridge temperature. The system is 100 per cent mechanical, and requires no power.

The aim is to cool beer not by using electricity, but instead through employing physical activity—in other words by only using the body to cool the beverages. We are building on the well-known concept from a freezer, where a difference in pressure in the cooling fluid ensures cold foods.

The boys behind Cool by Human want to offer everyone at Roskilde Festival the opportunity to cool their own beer in an eco-friendly way which is also free of charge.

All four are in their fourth semester at DTU where they are studying for an MSc in Design & Innovation. The primary aim of the programme is to provide an insight into developments in technical design.

TechLab showcase Sunday 4 p.m. – 6 p.m.



The innovative urinal (PeeFence)

PeeFence is a simple and flexible urinal made of plastic. The urinal is set up wherever it's needed by unrolling a sheet of plastic and securing the urinal to a wire fence. The PeeFence urinal is easy to transport and install on the fences enclosing the camping areas at Roskilde Festival.

Even though a lot of thought has gone into every single detail, the urinal is still ingeniously simple—basically formed from one sheet of 1 mm thick plastic with small mounting holes.

Two small elasticated plastic rivets and accompanying rings ensure easy and secure attachment of the folding part of the urinal.

The outflow consists of a silicone tube which can be folded for easy transport. The urinal is cheap to produce, easy to transport and fit while potentially also greatly reducing the volumes of urine close to thefences.

TechLab showcase Sunday 12 noon – 2 p.m.

Engineers without borders: Festival wind turbines

Roskilde Festival is regarded as a perfect test location in Denmark for simple Savonius-type wind turbines prior to subsequent field testing in Tanzania, as the logistics and infrastructure conditions are comparable while requirements are correspondingly less than in normal towns.

The project involves the construction and erection of a simple small-scale Savonius-type wind turbine. The concept's original target group is villagers not connected to the electricity grid in Tanzania, for which reason recycled components are used to make the wind turbines, including car batteries, alternators and steel drums for the blades, etc., which are all available from scrapyards.

The intention is to test the wind turbine's power production and to investigate alternative components for the construction.

TechLab showcase Sunday 2 p.m. – 4 p.m.

LED lamps and human behaviour

Is it possible to influence human behaviour within a given area? Through the use of LED lighting with high and low colour temperatures which are perceived as being white (‘cold’) and yellowish (‘warm’) light, we will see whether it is possible—on a broad flight of stairs with several sections going in the same direction—to encourage more or fewer people to take a particular direction when moving up and down the stairs by means of light.

The aim of the experiment is to find out whether people ascending or descending stairs prefer ‘cold’ (white) or ‘warm’ (yellowish) light. The experiment can be used in future by the festival organizers to guide or direct festival-goers to or from a specific area by means of light and thereby perhaps reduce pedestrian traffic in areas where there is a lot of motor traffic. Other but perhaps more widespread use could be possible in ordinary urban areas where you want to create secure surroundings for people moving about.

The idea is that individual tracks are illuminated with different lighting, while automatic flow counts of pedestrians take place simultaneously in the two differently illuminated areas. On some days there will be cold light on the left-hand side and warm light on the right-hand side. Other days there will be warm lighting everywhere. At the festival, the lighting will be changed each day in various combinations to obtain the best possible statistical basis for being able to analyse people’s behaviour.

Power cable with integrated power flow indicator

The purpose of this project is to visualize to the public how smart grids can use electric cars as energy reserves. The project uses a power cable that shows which direction the current is flowing.

The idea is to wind copper wire around the cable and connect a microprocessor which can measure the direction of the current. This information will then be used to switch on LED lights along the length of the cable. The LED lights will be installed in a double spiral, and will pulse according current flow direction.

Extra effect will be obtained through colour codes with red indicating that the electric car is using electricity and green indicating that it is now supplying electricity to the grid.

TechLab showcase Saturday 2 p.m. – 4 p.m.

Recycling of screws

Every year, Roskilde Festival's many stages and stalls are rebuilt from scratch. This requires huge quantities of construction materials, including 600,000 nails and screws. By introducing a simple machine which can sort the screws, Roskilde Festival would be able to reuse up to 90 per cent of them every year.

When the festival is over, the screws are discarded because they vary in length and head type, which makes it time-consuming and difficult to sort and reuse them the following year. This resource waste is both a financial and environmental cost.

A machine to sort the screws is now being developed. This will quickly and efficiently recognize the different screw lengths and slot types and discard damaged screws by means of visual detection.

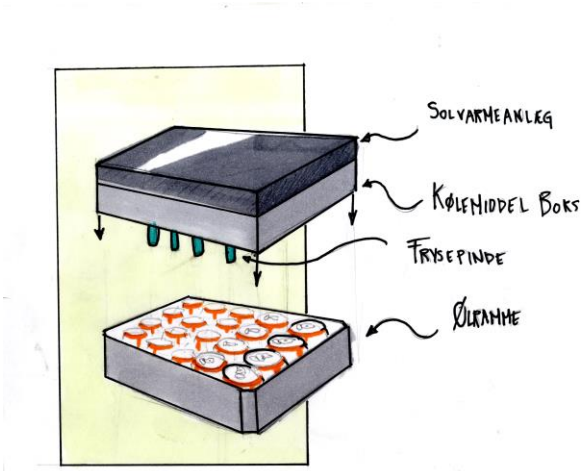
The vision of the project is to be able to help at other festivals, and in this way ensure that screws are used in a more environmentally sustainable way.

TechLab showcase Friday 2 p.m. – 4 p.m.

Solar cell-cooled beer (SunBrew)

Having the festival blessed with good weather is of course wonderful, but one of the main drawbacks is lukewarm beer. The SunBrew project will try to capitalize on the sunny weather to ensure festival-goers cold drinks at the site.

The idea has been transformed into a construction, where 15 freezer sticks are impaled in a beer crate and thereby cool the beers. The secret lies in the activated carbon which ensures vacuum in the 15 freezer sticks. This process is—as such—a one-off, but then the sun comes into the picture. The sun's energy is used to heat the activated carbon and thus regenerate the process. Then the drinks can be cooled one more time.



According to the students behind the project, it would make a lot of sense for Roskilde Festival to sell these beer coolers in their merchandise shops or at the beer stalls and thereby target the festival-goers who bring their own drinks.

TechLab showcase Saturday 4 p.m. – 6 p.m.

Piezoelectric polymers for energy harvesting

The project involves using piezoelectric polymers to generate electricity. Piezoelectric polymers are a material that can generate electricity when exposed to mechanical stress, such as when bent.

The project exploits this property in a device which can generate electricity when festival-goers interact with it. It could be a piezoelectric plate, which makes a lamp light up when the plate is trodden on.

As Roskilde Festival consumes a lot of energy, the project can be seen as presenting a possible alternative energy source. By implementing piezoelectric plates at Roskilde Festival, the technology can be examined in use to explore its future potential.

Future possibilities for the technology include application in places where large numbers of people move around each day, for example at rail and metro stations.

TechLab showcase Friday 2 p.m. – 4 p.m.

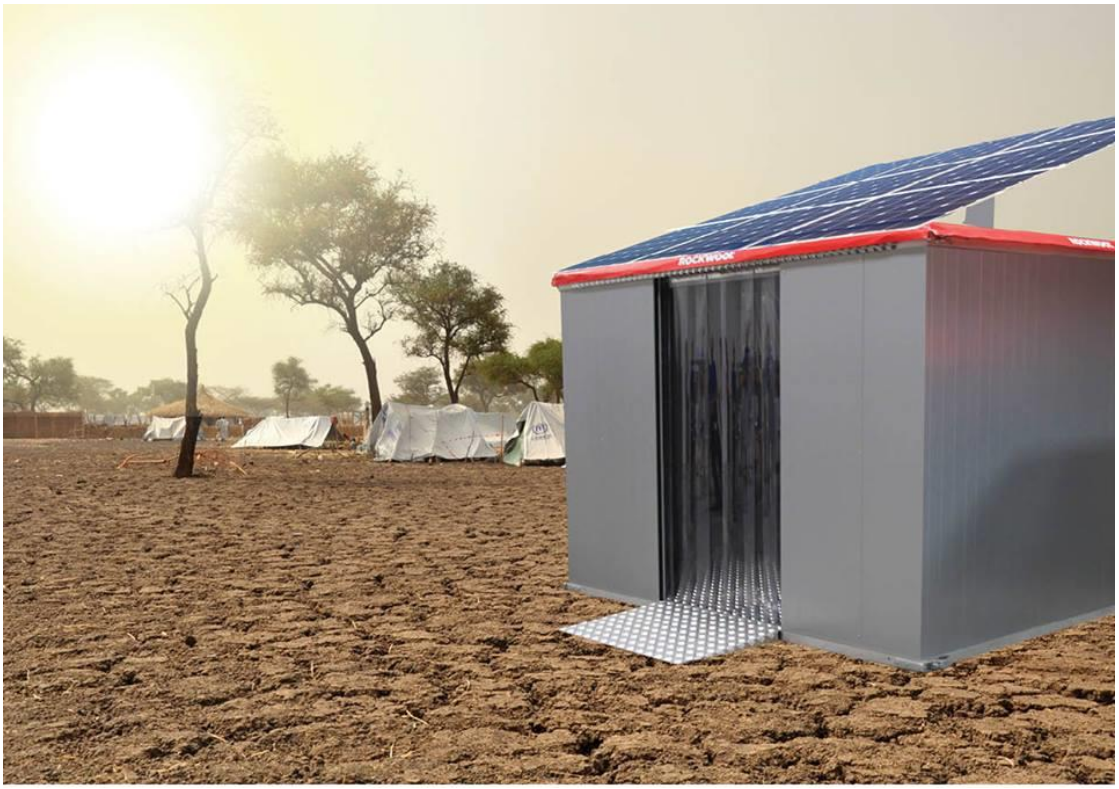
Storing food in refrigerated containers

Rockwool Cooler is a refrigerated container measuring 2.3 x 2.3 x 2.3 metres, insulated with stone wool and fitted with a renewable energy-powered cooling system. Initially, it will be based on solar power generated in solar cells placed on top of the container.

At Roskilde Festival 2014, the refrigerated container will be placed in 'Mediebyen', where it can be seen in operation. In order to further develop the container, during the festival the batteries, solar cells and container use, etc. will all be measured.

Rockwool Cooler can be used for storing foods, medicines etc. in areas without electricity. The cooler could, for example, be used in disaster areas where there is a big need for cooling items.

After Roskilde 2014, the project will continue, and the new data will form the basis for optimizing the container's insulation, design, cooling system as well as its energy source.



Rockwool Cooler container—use

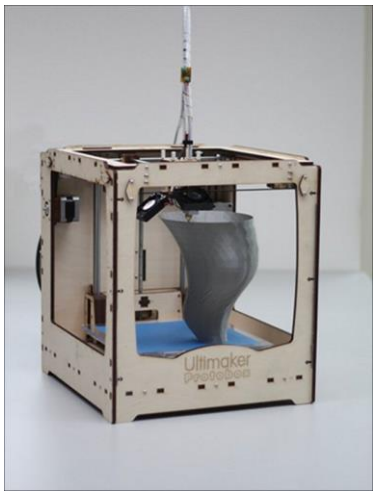
Rockwool has developed a collapsible refrigerated container which will be set up at this year's Roskilde Festival. The purpose of the project is to make the refrigerated container more eco-friendly. We want to optimize energy consumption by finding a functional door solution. To achieve this, user processes relating to the refrigerated container are being investigated.

The way it is used has a major impact on the container's energy consumption. There is a shortage of data about specific situations and patterns of use which can serve as a basis for designing a door. During the festival, we will conduct observations and collect data when the refrigerated container is in use. By studying the container, we want to learn about the way in which refrigerated containers are used, for which reason it is also relevant to consider and compare Rockwool Cooler with other refrigerated containers.

The Rockwool container has been developed for potential use in refugee camps, and so the worth of the optimized container goes far beyond this festival application.

3D prints of items you need

3D printers have been brought to Roskilde Festival this year to demonstrate how you can make home-designed objects quickly and easily. In addition, we hope that many festival-goers will get an idea of how this new technology can potentially change their daily lives.

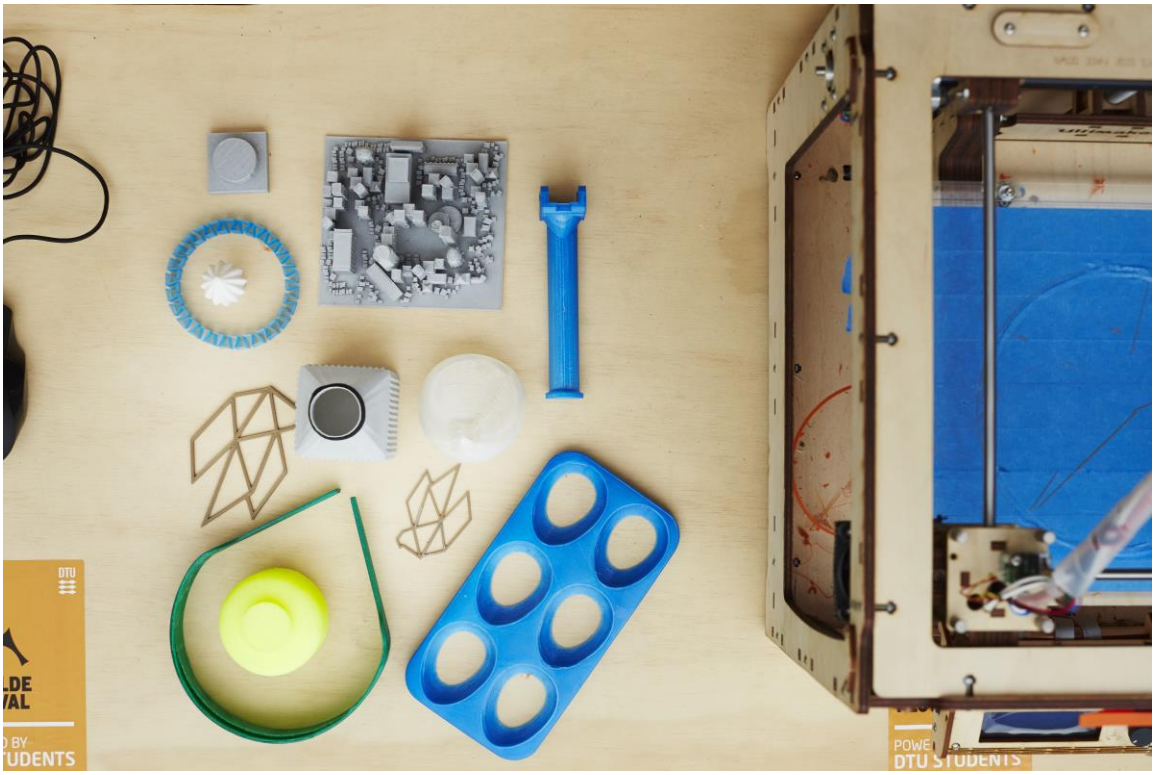


3D printers have fallen so much in price over the past year that they are now generally affordable. Today, the cheapest printers cost USD 100. They create objects by building them up in layers like a layer cake. Since each layer is produced individually, objects do not need to be solid— they can be hollow.

A 3D printer is therefore waste-efficient in two ways; it does not use more material than necessary (as opposed to a milling machine or a lathe), and it can produce hollow objects.

The plastic used is made of maize starch and is therefore biodegradable.

TechLab showcase daily during opening hours.



Let there be light ... (Light Feeling)

‘Light Feeling’ is an interactive wall of light-emitting diodes which copies movements. The idea of the project is to create interaction between technology and people as well as between people.

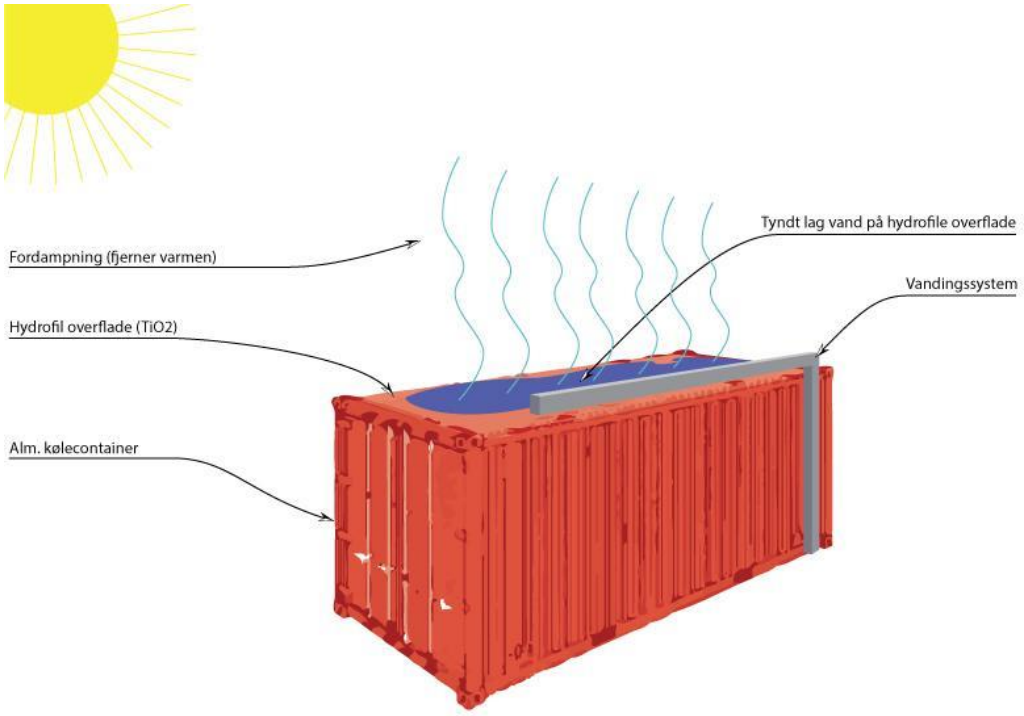
The hope is that the project can also arouse people’s interest in and give them an insight into the technologies which make Light Feeling possible. Light Feeling will be set up at this year’s Roskilde Festival near the Apollo stage in a decorative capacity.

The project holds potential as an installation object in many different contexts including other festivals, playgrounds, amusement parks, exhibitions, etc.

Paint cools refrigerated container

The refrigerated containers which are temporarily being used to store and transport food and other temperature-sensitive products at Roskilde Festival are power guzzlers. This project optimizes energy consumption by, among other things, painting the roofs of the containers.

During Roskilde Festival, there are more than 100 stands involved in cooking and preparing food for festival-goers. These stands use containers, which use electricity—and a lot of it, 24 hours a day. This project involves optimizing the containers' energy consumption, thereby ensuring a more eco-friendly Roskilde Festival.



The project seeks to reduce the energy consumption of a number of test refrigerated containers by installing watering systems and by giving the roofs of the containers a coat of titanium dioxide (TiO_2). When the water evaporates, according to thermodynamic principles it draws energy, i.e. heat, out of surface, thus cooling the container.

If the experiment at Roskilde confirms our calculations and the containers use significantly less power, it will be very relevant to look at whether the concept could be developed for other outdoor events or applications.

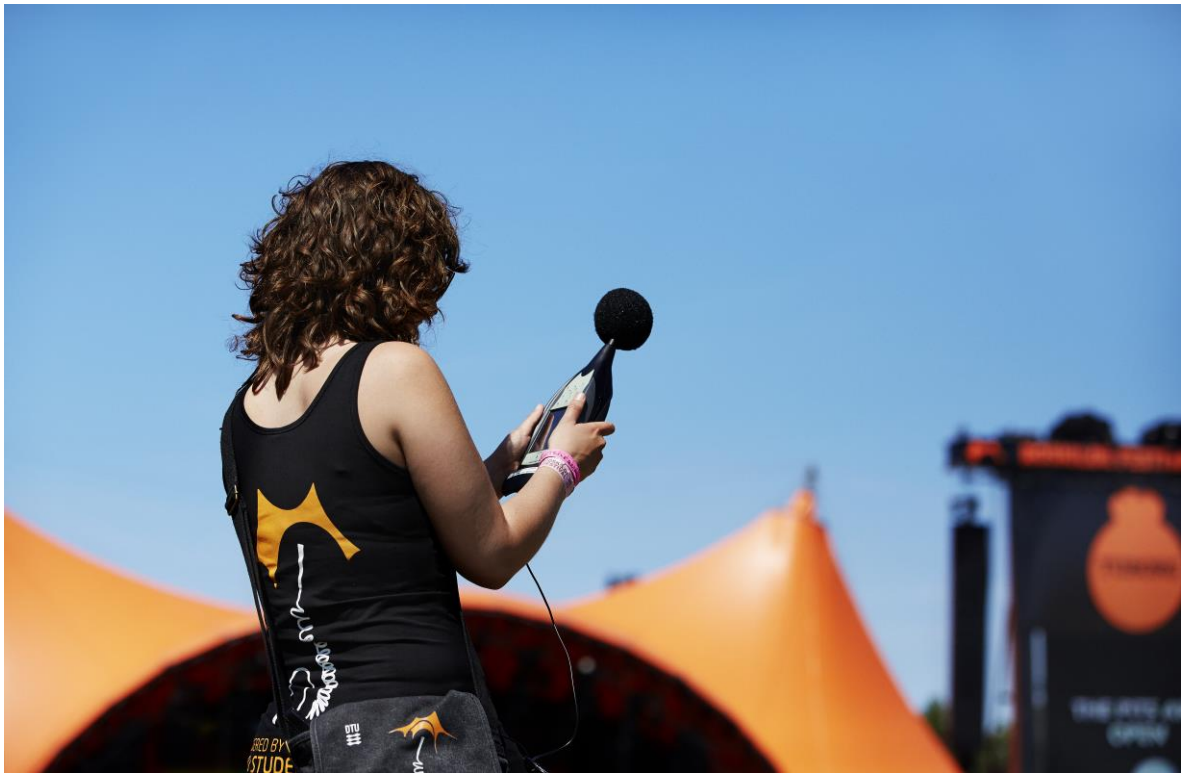
Acoustics and audio projects

Project 1: Apollo stage—PA system

This year, the Apollo stage has a new PA system, which is based on the 'point source' principle where all the loudspeakers are placed at a central location. This is expected to produce sound pressure which declines faster with distance than what can be achieved with a so-called line array. A delay system has been established to enlarge the enclosure for festival-goers. The project studies the coverage of 'point source' PA systems and the delay system by means of both simulations and measurements. The PA system's performance will also be subjectively evaluated in collaboration with test experts from the hearing aid manufacturer Oticon, who are at the festival wearing a modified hearing device which registers sound levels.

Project 2: Avalon (Cosmopol)—Tent acoustics and spread to other stages

This year sees the opening of a new stage at Roskilde—Avalon. The tent is a modified and more open version of the tent which previously housed the Cosmopol stage. The larger opening is expected to markedly change the acoustics both inside and outside the tent. The more open stage will probably also mean that there is more spillover towards the audience areas at the other stages, and this must be studied.



Contd ...

Acoustics and audio projects—continued

Project 3: Sound levels on the Arena stage and backstage

Last year, the sound pressure levels in the audience area at the Pavillion and on stage were measured and compared with measurements taken at the mixer console. This year, the same measurements will be made at the considerably larger Arena stage and extended to include the backstage area.

Project 4: Long-distance sound level from the stages

The sound levels being registered at properties neighbouring the festival site is also a point of concern. This project explores methods for measuring sound levels at neighbouring houses, and also seeks to identify how much the different stages contribute to the overall problem. We use several signal processing techniques which were also used at last year's festival. The stages are not the only culprits with respect to noise—a lot of noise also stems from the campsites. The festival needs a system for mapping and separating the overall sound level from each camping area—which can be measured from the Agora towers—from the sound levels which are registered in the festival site.

Waste projects

We study whether there is a difference in people's waste mentality depending on which area they are staying in, and whether the distance to the nearest waste bin is relevant. We want to make specific recommendations for more sustainable waste management at Roskilde Festival.

Three groups will examine festival-goers' awareness in relation to waste and the importance of infrastructure in relation to the positioning of waste bins etc.

The projects will, among other things, examine:

Are festival-goers more aware of waste in cleaner areas compared to festival-goers staying in dirtier areas?

- Method: A questionnaire, which gets to the bottom of festival-goers' attitude and how they experience the festival. Are they, for example, used to sorting waste at home, and why have they chosen a messy patch rather than one of the cleaner areas?
- Counting the number of abandoned tents in clean areas and in messy areas
- Study of the level of waste sorting in clean areas and in messy areas

Is the infrastructure at the festival—for example the distance to waste bins—a crucial factor? Will spending money on more waste bins, or more signage, more information, etc. make a difference?

- Method: We examine the difference in the volumes and types of waste left behind on the ground in relation to the distance to the nearest waste bins in different parts of the festival site.
- We also test the volumes and the make-up of the waste left on the ground as a result of the distance to the waste bins
- We will study the waste sorting quality as a function of the distance to the trash stations.

From a lake to cool beers

Sustainable cooling with water is our vision of an energy-efficient cooling system for beverages which will use water from, for example, a lake or a bathing pool.

Cooling typically uses a lot of energy, and is undoubtedly the process which uses most energy at Roskilde Festival.

By pumping cold water into a container with drinks and circulating it with an energy-efficient pump, heat is transferred from the drinks cans to the water, resulting in cold drinks.

This is a simple and highly energy-efficient cooling principle which can be used anywhere where there is access to cold water.

TechLab showcase Friday 16-18.

Press release:

DTU at Roskilde Festival for the 5th time

For the 5th year in a row, Roskilde Festival is collaborating with DTU, Technical University of Denmark, on developing engineering solutions to the challenges involved with having over 100,000 people gathered in one place.

As part of their training, around 90 DTU students will be at the festival site and the camping area. Through more than 20 projects—ranging from cooling, waste management, and acoustics to a test version of an inexpensive and simple urinal that leads the urine away from the fencing. DTU students create solutions that work in Roskilde Festival's ruthless environment.

Around the festival site and the camping area, festival-goers will therefore meet several engineering solutions designed by DTU students—all crafted to help improve festival conditions.

A most welcome contribution according to Roskilde Festival spokeswoman Christina Bilde:

“Every year, Roskilde Festival becomes Denmark’s fourth-largest city. It is therefore only natural for us to enter into collaboration with educational institutions such as DTU as the DTU students work with the solutions required to make the festival function, and the partnership offers us valuable knowledge and insights for use in our future planning. Also—which is equally important for us—it gives the students an opportunity to test their knowledge and ideas in practice, which means that we help the students along in their training. And we a proud of being part of this process,” says Christina Bilde.

The collaboration between Roskilde Festival and DTU dates back to 2010, and Martin Vigild, Senior Vice President and Dean of Graduate Studies and International Affairs at DTU and one of the founders of the partnership, is very pleased that DTU students have the opportunity to use Roskilde Festival as a laboratory for their bright ideas:

“It is a great asset to DTU. By working together with Roskilde Festival the students learn a lot about what it takes to create functional engineering solutions in collaboration with an actual client. And this is the very essence of their training which is aimed at preparing them for solving small and large problems in society. We are also very interested in our students becoming innovative and entrepreneurial, and we can see that three DTU student-driven start-ups have already spawned as a direct consequence of the collaboration with the festival," he says.

Meet the students and hear more about their projects in TechLab at Arena

TechLab is open on Thursday from 5 p.m. to 8 p.m. and Friday, Saturday and Sunday from 12 p.m. to 6 p.m.

DTU’s journalists will be on site during the entire festival and can be contacted for further information about the projects:

Tore Vind Jensen, +45 3026 7710 / tovi@adm.dtu.dk
Christina Tækker, +45 2489 8388 / chrit@adm.dtu.dk

For further information about the collaboration between Roskilde Festival and DTU, please contact:

Martin Vigild, Senior Vice President and Dean of Undergraduate Studies and Student Affairs, DTU, +45 4525 1009 / 2446 1655 / bachelordekan@adm.dtu.dk

Contact Roskilde Festival's press service on +45 3010 8281 **/** press@roskilde-festival.dk

About the collaboration:

In 2010, Roskilde Festival and DTU entered into a formal collaboration on using the festival as a future laboratory and create innovative engineering solutions to some of the festival challenges.

The students will earn five ECTS points in the course of the project period.

Among other things, the collaboration has given the DTU students behind the start-ups Volt, DropBucket and Kubio a platform to test their technology before they started their enterprises.

Follow DTU's own coverage at http://www.dtu.dk/

Map of DTU projects at Roskilde Festival 2014

Apart from the marked projects that has a permanent location, DTU also has projects with a more dynamic location.

Descriptions of where these projects are executed, and a showcase schedule can be found on the posters in FrontLab.

For further inquiries contact a staff-member at TechLab

- Agora
- ATM
- Clean Area
- Disabled Toilets
- First Aid
- Fishing Lake
- Gate
- Hot and Cold Showers
- Information and Lost & Found
- Kiosk
- Laundromat
- Cloakroom
- Merchandise
- Mobile Recharge
- Pharmacy
- Swimming Lake
- Toilets
- Trash Station
- Wi-Fi

Clean Bean

Ligh Feeling In front of tent #3

TiO2 - Paint Cools (Control)

Pee Fence

BackLab

TiO2 - Paint Cools

Cooling by lakewater (test)

FrontLab

ROSKILDE FESTIVAL

POWERED BY DTU STUDENTS