Renovation plus - on the way to a climate-neutral and sustainable school country home [EN]

The school country home in Springe, Germany, is owned by a non-profit association, the house has a capacity for two school classes...
The management and the staff continuously work on the subject to make it more sustainable.

I'm Paul Simons, CEO by the BlowerDoor GmbH and Chairman School Country home.

I would report about it and especially about the retrofitting of the sports hall

But at first, I would like to tell you about my important Impression from the 23. Passivhauskonferenz.

There gave Diana Ürge-Vorsatz, she is from the European University, and is one of the Co-authors of the IPCC Special Report „Global warming of 1.5°C". She gave a speech about it.

Her summary is: In order not to exceed the limit of an additional 1.5 degrees Kelvin, a maximum of 500 gigatons of CO2 may be emitted into the atmosphere. We currently emit 50 gigatonnes a year. This would mean that we only have 10 years left.

We have to act, that mean to reduce the CO2 emission immediately.

In the Country school-home, we started in this sense, ten years before with changing to Green certificated electricity

Food is a big driver by global warming, it causes about 25 % of all greenhouse gases. For plants fertilizer, feeding animals, processing, transportation, Packing, processing of food waste. The most important point by Food is nowadays the impact of animal-based products like meat, milk, cheese. To reduce the part of animal-based food is the main path to more sustainability by food. The switch to reduce animal products is in the school country home almost complete. Vegetarian and vegan food is regularly served.

We try to reduce the effort for the transport of products and staff and management.

Maybe that the member of the board came by train. Sometimes it is in funktion.

We invite the guests to use public transport for their visit to the school country home.

In 2017 we refurbished the 300m² sports hall, built-in 1970, to the zero CO2 emission building, about this I will talk mainly.

you see the facade from the Main building without insulation and part of the inefficient heating system.

The institution emits 74 tons CO2 per year for heating, food and mobility,

we compensated it by payment to an Ethiopian forest project.

Our aim is to improve to a nearly zero CO2 emission organization at least in 5 years.

The sports hall was built in 1970 with stone walls. The roof was so air leaky that additional ventilation never was necessary.

In the wintertime it was uncomfortable, so it was only useful for groups to play powerful.

The project to renovate the Sportshall started 2015 with the destroyed floor The hall was also in the points like the windows and the roof in a bad state.

The project stood under the pressure by a strict timeline, caused by the 14-week gap without guests in the house.

one of the investigations of the old hall was the measurement of the airtightness with the result (n50 = 7.9h-1, the limit for the hall was 3.0 h-1). It shows the hall was very leaky.

Here you see the hall without windows, and a new opening for the emergency exit,

removing the concrete floor.

The roof plates material was with asbestos fibre

The remaining Material contained 50.000 kWh manufacturer energy

The building needs for heating and electricity calculated 10.000 kWh per year.

The construction contained an important part of energy.

The red line is the airtightness layer. Outside of the airtightness-layer is the Layer of insulation.

The airtightness-concept was plotted in an early phase of the planning.

The Important points are detailed planed and described. for example, we found air gaps on the underside of the sandwich panels, which are closed with sealing compound.

The insulation Layer was also detailed planed, especially the minimizing of the thermal bridges at the interface between roof and wall and around the windows.

Now a short advertising Block for the FLIB –the airtightness association from Germany. The FLIB has created the paper „FLiB airtightness concept “, that content the Procedure for creating Airtightness

concepts for residential buildings and makes it easier to renovate and produce tight buildings according to the limits. I hope it is in the next year in english available..

The Roof was built with sandwich-elements with the U-Value 0.17 W/m²K, we did found a better for an acaptable price.

The triple glass windows with a U-value = 0,82 W/m²K are nearby the Passivehousestandard

The windows are build-in in the layer of the insulation.

The wall insulation is a timber frame construction covert with wood fibre plates and filled with cellulose insulation.

The floor has only 10 cm insulation, that was caused to get the same floor level in the hall and the entrance room.

The biggest energy gap is the thermal bridge between the floor and wall. Here we have the potential to improve it from the outside with horizontal insulation.

Installed is an passivhousezertifikatet Ventilation System with heat recovery

and heat pump (Air-Water) with 30W/m² .

With the heat pump, we can heat and cool the building.

The energy came by an air-heater in the hall.

15 lamps are installed. They have two power modes. Less light use 0.6 Power, by full light it uses 1.8 kw power. The old old lamps used 5 kW power.

Problems:

We have problems to understand the handling of the Ventilation-system because the manual is not so user-friendly.

The Air-heater is too noisy. The electrical Craftsman has to Install an easily operate switch,

We conducted two BlowerDoor tests, one in an early Situation. We found some leaks and gaps especially in the interface between Wall and windows. Some of the gaps were sealed.

The final BlowerDoor test gave the result n50 = 0,3h-1 The limit for the Passivhaus is 0.6 h-1.

The origin of the Products.

We calculated the manufacturing power only for the old product according to the database: oekobaudat.de

In a sustainable world, it is important to know the footprint of the products we use. By the hall, we tried to look where the wood is coming from. We wouldn't like to use wood from Siberia, because it isn`t really clear if it is wood from a planed forestoekonomie.

The fiver wood panels are from the black forest in Germany, it 600km far.

The larch for the facade was grown and sawed in 50 km distance.

The Oak parquet came from Croatia 1200km distance
The Cellulose-insulation produced in Austria, Wood for the cellulose, I assume –the Cellusefibre material came from worldwide maybe Sweden?

From some installed wooden products we have no idea where they coming from. Like the substructure oft he floor.

Craftsman driving to come to the hall and pickup forgotten materials caused 8000km by car.
The 600l fuel that are 6000kWh came from worldwide

The energy consumption of the hall was calculated with 10.000 kWh electricity, for heating, cooling, ventilation and light. Calculated according the Iso 18532
Callculated according the PHPP ist 35kWH /m² for heating.

The normal temperature for sport is 17°C
For choir sessions 20 °C
Without activites 14°
We need about 2 days to rich the higher temperature level

Used in the last year are 6000kWh.

If in the winter the Hall is in use with maybe 25 Persons by 0° C outside temperature, It`s getting without heater warmer.

To call it zero-Co2-emissions building is for us correct because:
we have in the first step reduce the energy consumption to a very low level and the rest of energy is delivered by green electricity.

Groups like the refurbished hall.