e-workshop: Championing sustainable energy in SMEs
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RESINDUSTRY
Interreg Europe

An implementation case: MALFINI – Hybrid photovoltaic system with accumulation in batteries

Ing. Jan Špale
Czech Technical University in Prague, University Centre for Energy Efficient Buildings

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Best practice – RES installation in Industry

- MALFINI, a.s. – supplier of promotional textile situated in the Czech Republic – large warehouses
- Motivation – CEO‘s vision of www.greenmalfini.cz/en - CSR + „green marketing“
- Project for solar PV installation on the warehouses rooftops and its shell combined with LiIon batteries and two innovative ICE CHP units, EVs and el. forklifts all coupled with purpose designed I&C system
- Supported by OP IEC 2014-2020 by MIT „Low-carbon technologies“ II.
- In operation since September 2019
- Investment of 650k€ with approx. 50% co-financing for the PV + batteries, CHP units 115k€ w/o subsidy + credit
- The company reached 82% self-sufficiency on the site energy demand
- 160 tCO2/y savings and 41% carbon footprint reduction
- Large electricity overflows to the grid – almost one third -> feed-in tariff

HYBRID PHOTOVOLTAIC SYSTEM WITH BATTERIES AND CO-GENERATION

✔reduced power supply dependency ✓reduced emission footprint✓ back-up system ✓ in case of power failures

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MALFINI A.S.

Photovoltaic power plant

Zero emission source of electricity

The photovoltaic power plant consists of two parts – one placed on the façade and the other on the flat roof.
The part on the façade will add to the co-generation units by producing extra energy, especially in winters.
The flat-roof part is a load-bearing structure, which does not require any holes to be drilled in the waterproofing layer.

The average load is about 16 kg/m^2.

The power plants include conventional on-grid converters transmitting the power produced to the main switchboard of the entire system in a kiosk with batteries.

296 kWp
Power of the entire power plant

280 MWh
Annual output

947 units
Number of PV panels

100

At full power, the photovoltaic power plant will produce electricity that could power up 100 single-family homes.

Allblack panels on the façade

320 Wp
Power per façade panel

77 kWp
Power of the power plant placed on the façade

"Allblack" panels are used on the façade, which have most of their visible parts in black and are therefore suitable for designer applications.

Did you know that the winter sun only forms an approx. 20° angle with the horizon and it is, therefore, advisable to install photovoltaics on the façade wherever we need to generate electronic power in winter?

Accumulation, batteries

Any surplus power is managed and stored for later use

The battery unit serves as means of accumulation of power from the power plants (PV, CHP), as a backup in case of any grid failures and also as a balancing element for the flattening of demand peaks.

The lithium batteries are fitted with two separate converters with a total charging and discharging power of 200 kW.
Up to this power level, the plant may work in backup mode, e.g., in the event of a power failure.

With fully charged batteries, the warehouse can operate for several hours.
In addition, if the sun is shining and it is possible to start the co-generation units, the energy supply independence will last for several days.

360 kWh
Battery capacity

6,000 cycles
Battery life

Battery capacity can be software "controlled" – depending on the current utilisation and operational needs. For instance, the system may be set so that the batteries are always charged to 50% and, thanks to this, the facility is blackout-ready.

Cycle denotes the condition at which 100% of its capacity flows through the battery. In our case, 1 to 1.5 cycles per day are expected. However, the batteries are still expected to keep 70% of their original capacity and continue to operate even after 6,000 cycles.

Co-generating units

Addition of power sources to the existing heating system

58 kW
Heat output

25 kW
Power output

4,400 h/year
Operating period (October-April)

The world's first co-generation unit with a condensing module in the default package.
Internal combustion engine connected to a generator.
Power on shaft energy = power; engine and flue gases cooling = heat. Two machines.

Smart charging

Forklift truck and electric vehicle charger control will increase the efficiency of the new sources.

The chargers are controlled based on the power input and production of electric power, according to the production forecast and the weather forecast.

Forklifts and electric vehicles will be charged in three basic modes:

1) I need to get the vehicle charged now; I can't wait
2) I just need the vehicle charged by tomorrow
3) I can wait more days

As for the 2nd and 3rd scenario, the system will come up with the most economical time for the charging operation in terms of the energy price and also the site's current power demand.

The weather forecast is also a factor here.
For instance, if the charging takes place over the weekend, the system will wait until Sunday if fair weather is reported.
At that time we expect the photovoltaic power plant will generate enough power that will be "free".

Measurement and control

System superior to all power sources and consumption

The Measurement and Control System knows at all times where and how the power is used.
It is the heart of the whole assembly. Without it, they would all just be "dumb" sources.
Predictive control and the weather forecast link substantially increase the system efficiency.

General designer

YOUNG4ENERGY

General supplier

nwt.

Thank you!

Ing. Jan Špale
Jan.Spale@cvut.cz
+420723414693
www.uceeb.cz/en

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