SUCCESS STORY:

A cascade of small wood chip boilers

INVESTMENT CASE

Title:
Cascade of wood chip boiler for heat supply at variable demand

Year (commissioned):
2015

Location:
8228 Beggingen, Switzerland

Stakeholders:
1. Hübscher Holzbau AG, Beringen, Investor and operator plant 1
2. Lutz Bodenmüller AG, Beggingen, Local heating company and investor plant 2
3. Heitzmann AG, Schachen, Supplier of the heat production plant

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Huebscher & Co. is a family owned company for timber construction in Beggingen, a village in the northern part of Switzerland. To valorise the wood residues, Huebscher decided to build a district heating network and to supply local buildings and consumers in the village with wood energy. District heating boiler stations are faced with long periods of low heat demand. Since part-load can lead to increased emissions, an additional fossil boiler is often used for part-load, resulting in 10 % to 20 % of fossil contribution to the network.

In the present plant, a concept with a cascade of several small-scale wood boilers was implemented and put into operation in 2012. With a total of six wood chip boilers of 200 kW heat output (1200 kW in total), part-load demand can be supplied with one or two boilers, while only during peak demand in the cold season, all boilers are in operation. A cascade of small boilers is also suitable for basements with limited ceiling height. In addition, maintenance of one boiler is possible while still maintaining more than 80 % of the nominal capacity.

On the other hand, the number of related peripheral equipment such as flue gas ventilators, electrostatic precipitators, and chimneys increase accordingly to the number of boilers. However, the storage of spare parts can be simplified due to standardisation. A second installation of the same concept was realised in a neighbour village to Beggingen by a local SME Lutz Bodenmüller AG and is in operation since 2015. When considering a cascade system, the wood quality needs to fulfil the requirements for small boilers, e.g. the fuel moisture content is limited to 35 % in the present case. These requirements needs to be taken into consideration in the fuel supply.

Fuel type:
- Wood chips (max 35 percent moisture)

Feedstock origin:
- Domestic wood manufacture by-products / residuals: dry chips, shavings, dust

Conversion system:
- Boiler combustion, e.g. stand-alone boiler plant including co-firing and combined heat and power

Co-fire:
- Heat generator (i e boiler) is 100 percent biomass-fired.

Heating system heat sources:
- Biomass is the only heat source in system

Local buildings and consumers in the village are supplied with wood energ.y

The investment and its technology

The heating plant in Begginen, installed in 2012, consists of a cascade of six identical automated wood chip boilers with 200 kW heat output and supplies the local timber company and a district heating network in the village of Beggingen. The second plant was erected in 2015 and comprises of a cascade heating with currently four identical wood chip boilers.

The aim is to provide residential heat for buildings by locally available wood residues and slightly pre-dried forestry wood chips.

Compared to an installation with one or two larger boilers, the concept of a cascade enables an installation in a basement of limited height and promises good operating conditions at reduced heat demand of the network. On the other hand, the installation is limited to wood fuel with a moisture content of less than 35 % and experiences with the concept and the control of boilers and heat storage needs to be gathered.

Factors behind the decision

The installation in an existing building meant limitations in the height of the boiler, which led to a solution with several small boilers. The use of standard heating devices enabled low investment cost and using several small units promises good part-load conditions at reduced heat demand.

Relation to Sustainable Development Goals:

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Make cities and human settlements inclusive, safe, resilient and sustainable

Ensure sustainable consumption and production patterns

Take urgent action to combat climate change and its impacts

In Switzerland, the confederation and the cantons support efficiency measures and the substitution of fossil fuels by renewables based on a national vote on an “Energy Article” back in 1990 and a consecutive national vote on the “Energy Strategy 2050” in 2017.

Lessons learned

For the presented case study, the installation of a cascade of small boilers was favourable due to limitations in room height, which might be an important issue in other cases, where fossil boilers should be replaced by wood boilers.

Success factors

Local entrepreneurs and financial support of the communities are needed to establish regional supply of forestry wood chips.

Replicability potential:

- Medium local replicability
- Medium regional replicability
- Medium national replicability
- Medium international replicability

Scale-up potential:

- Low local potential
- Low regional potential
- Low national potential
- Low international potential

Comment:

- The presented project resembles a typical and ideal situation of an SME production sites in a small town in Switzerland. There is a limited number of significantly larger applications in Switzerland, while in other countries, larger production sites are also common. Connection to policy case:

Constraints

Since biomass systems exhibit higher investment cost than fossil systems, biomass systems are only favourable if a strong focus on sustainability is met and a significantly longer depreciation period is accepted by the investor. In the present case, the cooperation between local entrepreneurs and local wood industry enabled the implementation of biomass plants.

A cascade of several small-scale wood boilers is implemented in the plant.

Web sites:
www.heitzmann.ch
huebscher-holsbau.ch
www.solarlutz.ch
www.ri.se
www.energimyndigheten.se/en/
www.iea.org/tcp/
www.ieabioenergy.com

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