



*Idbäcksverket in Nyköping*

*Photographer: Gunnar Britse*

### Technical facts Idbäcken

**Facility:** Combined heat and power plant (CHP)

**Location:** Idbäcken in Nyköping, Sweden

**Boilers:** Bubbling fluidised bed (BFB) and circulating fluidised bed (CFB)

**Capacity:** 100 + 35 + 35 MW  
(+15 flue gas condensation)

**Fuel:** 40-100% wood and 0-60% coal

## Improving Idbäcken – A R&D success story

The Vattenfall Group has many years of experience in burning biofuels and is responsible for about 100 biomassfired plants in the Nordic region. Through our in-depth knowledge of measurement techniques, flow models, materials and corrosion we are able to continuously optimise our own and our customers' bio boilers.

One shining example is the refitting of the biomassfired combined heat and power plant in Idbäcken, Sweden.

### Background

Vattenfall Nordic Heat has more than 30 years of experience of burning biofuels. We are committed to reducing production and maintenance costs in our own and our customers' bio-boilers, while at the same time increasing fuel flexibility and boiler reliability. This is achieved through continuing research and development.

Although biofuels are environmentally friendly, they are not friendly to the boilers themselves. Compared to fossil fuels, biofuels have a higher content of corrosive alkali chlorides in the flue gases, which cause sticky deposits to form on the heat transferring surfaces inside the boilers. Biofuels also have a different volatile to char carbon ratio, which changes the combustion behaviour.

This can lead to lower availability, lower maximum capacity, reduced fuel flexibility, higher emissions and higher maintenance costs. This was the case at Idbäcken, which was basically constructed for coal, although sold as a multi-fuel bubbling fluidised bed boiler (BFB).

Since it was commissioned in 1994, the plant has suffered from the above mentioned problems with increasing amounts of biofuel. Because of this, intense work has been carried out to improve boiler operation.

### Refurbishing Idbäcken

The goals when improving Idbäcken were to:

- Improve the efficiency
- Expand the fuel range
- Lower the maintenance costs

The improvements were made methodically by reviewing previous work, followed by calculations, advanced modelling and full-scale tests.

The project was finished in a short period of time and with a low cost. The project was a great success and resulted in:

- Lower emissions
- Greater fuel flexibility
- Improved efficiency
- Lower maintenance costs

There have also been a number of spin-off effects. The experience gained has been applied to our other plants in Germany, Poland and the Nordic countries. Several interesting and usable products were developed and are now commercialised as separate products by the Vattenfall Group.

### The work carried out

Several improvements were made during the refurbishment of Idbäcken. The most important ones are listed below.

### Improved combustion efficiency

The fuel feeding system is generally the most important function that makes the combustion effective in boilers with fluidised beds. Idbäcken had problems with unevenly distributed fuel on the bottom of the boiler, and that led to higher CO- and NOx-emissions when biomass was the main fuel. To solve this problem a redesigned pneumatic feeding system was developed, constructed and installed.

The results were successful. The combustion was more evenly distributed which led to higher combustion efficiency and lower emissions. Today, redesigned pneumatic systems are installed at several fuel feeding lines within the Vattenfall Group.

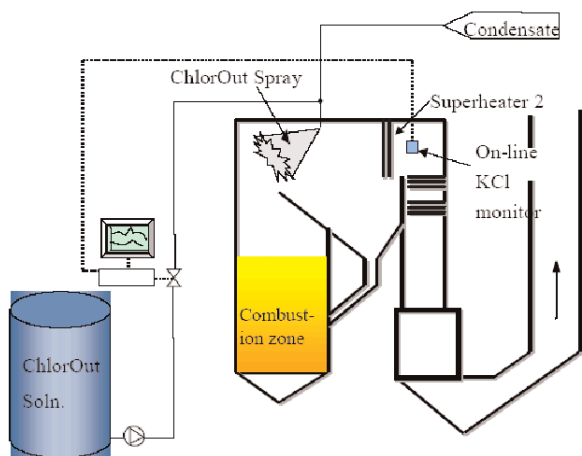
### Fuel flexibility

Biofuels give rise to a higher content of corrosive alkali chlorides in the flue gases. This costly problem has been solved by the development of "ChlorOut" - a method which effectively reduces deposits and corrosion in CHP plants and other steam boiler applications. With the ChlorOut fuel additive, the alkali chlorides are converted into other chemical compounds that are much less harmful with regard to deposit stickiness and corrosion.

When using the ChlorOut method it is essential to be able to measure the amounts of corrosive substances in the flue gases. An In-situ Alkali Chloride Monitor, IACM, was developed for this purpose. This instrument continuously measures potassium chloride, sodium chloride and sulphur dioxide in the flue gases. This makes it possible to inject the right amount of additive, according to different operating conditions and fuel mixes.

This was the first time that such measurements had been made and the IACM-instrument has been in operation in Idbäcken since 2000. Today IACM has been utilised at many more plants. The results can be used for evaluating the quality of the fuel and optimizing the fuel mix and operation of the boiler. IACM coupled with ChlorOut make it possible to use a wide range of different fuels, without jeopardizing the boiler operation.

Measurements confirm that ChlorOut and IACM not only increase the fuel flexibility by reducing deposits and nitrogen oxide emissions, but also reduce the corrosion rate by 50%.

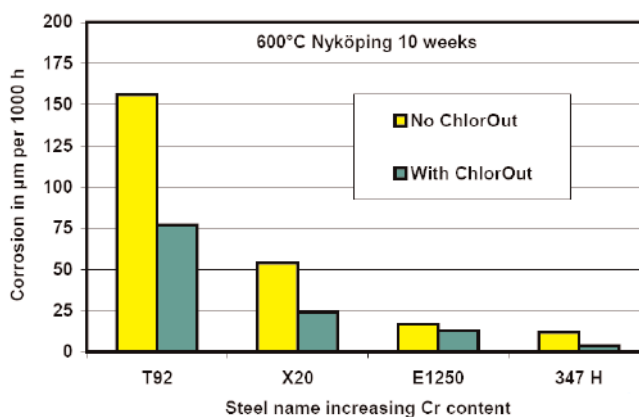


### Maintenance cost

As mentioned the corrosion rate could be reduced with ChlorOut and IACM, but corrosion was still a problem in the super heaters. To radically lower maintenance costs the superheated had to be changed to a material less sensitive to corrosion.

Over a dozen different materials were tested over a period of years. The tests showed that the steel Esshete 1250 had the optimum results when considering corrosion rate and cost.

Esshete 1250 is a steel containing 15% chromium. It has previously been used in coalfired boilers, but never before in boilers fired with biomass. The lifetime is four to five times longer than for high strength conventional steels like T91 and T92 and the maintenance cost is significantly reduced.



### Conclusion

The refitting of Idbäcken is a success story. A methodical way of working and the utilisation of existing knowledge have helped us to develop new solutions to well-known problems. The results have been implemented at other facilities, helping us to meet the challenge of developing energy systems for greater sustainability.

- Research and development forms an integral part of Vattenfall's efforts to achieve its vision of being a leading European energy company.
- We ensure that the systems we use today to generate and distribute electricity and heat are as efficient and safe as possible.
- We contribute to the development of the energy solutions of the future and ensure that they meet prevailing environmental, financial and acceptance demands.