

Cleaning is a must

There are different ways to clean heat exchangers

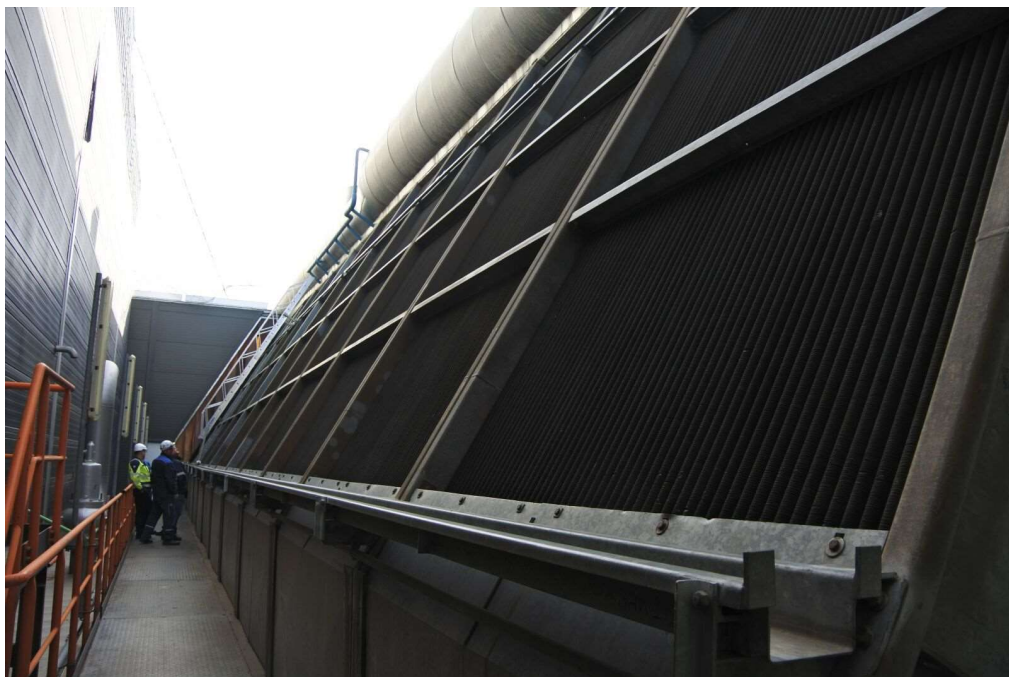
High pressure wash

Blasting with sodium

Blasting with ice grid

The different methods have different functions

Test case in The Netherlands



10 Cell ACC with oval tubes, four rows.

ACC was built in 1998

Performance results

The performance was measured before and after a high pressure wash

Back pressure turbine exhaust.

Before cleaning	276 mbarA
After cleaning	245 mbarA
Design	172 mbarA

Why not back to the design performance

Although the bundles were visually clean and most fouling was removed, there was still a difference between clean condition and design condition.

Different kinds of fouling

Fouling consists of:

1. fibers, pollen, dust, bird dropping
2. Scaling of the finned surface.

Fibers etc. can be removed by high pressure water cleaning. The impact of the water pushes the fouling out of the bundles.

scaling

Scaling is a kind of fouling that comes from dust and humidity.

When humid dust enters the space between the fins, it can stick to the finned surface.

After a while the heat from the process bakes the dust to the surface.

If the area is very dusty and often humid the baked dust can form a Serious layer.

In practice we saw bundles that were sprayed with hard town water. This action formed in a few months a thick layer of lime stone.



This kind of fouling either by hard water or humid dust is difficult to remove.

HP water spraying will not be effective.

The only way to remove this kind of fouling is blasting with calcium.

Effect of loose fouling

The loose fouling does obstruct the air flow.

Result higher flow resistance through the bundles with less air flow

For the heat transfer we need a certain mass of air.

If the mass of air is less the end temperature of the air will be higher and increases the end temperature of the product.

With an ACC this results in a higher back pressure, read less performance.

Effect of scaled fouling

Scaled fouling forms a layer over the finned surface.

This layer is a thermal obstruction for the heat flowing from the steam to the air, The HTC will drop.

With a lower HTC the temperature difference steam-air will be higher.

This increases the back pressure

Performance loss scaling

Going back to the case Twence

Back pressure turbine exhaust.

Before cleaning	276 mbarA
After cleaning	245 mbarA
Design	172 mbarA

It is clear that the difference clean and design, 73 mbar, is mainly the result of scaling.

This impact of the loose fouling was only 31 mbar

Actions

The actions to be taken for this case is a dry clean with sodium carbonate.

Although this process is environmentally safe, and will not damage the fins in a severe way, it is not recommended to do this kind of cleaning more often than once every two years.

Fortunately the time in need to form scaling is several years.

With the fouling software the time to clean can be determined.