Technical Bulletin

Technical Bulletins on the Internet: www.vecom-group.com

Number: 2004/10 May 2004

Custom-made cleaning solutions

Heat exchangers can be found in many places and consist of all kinds of materials. It may, for example, be a geyser in a house that transfers the heat (gas combustion) to the water. An optimum heat transfer is important for an adequate functioning of a heat exchanger. Depending on the medium that is used in a heat exchanger, there is a chance that the medium will contaminate the heat exchanger with a deposit, which reduces the hear transfer. The most well-known typical deposit is calcium carbonate that is present in a solution in tapwater as a carbonic acid complex ($CaHCO_3$) and precipitates during heating. Water purification products may remove this precipitation; however, in some cases it is not possible to use them.

Cleaning through circulation

This bulletin discusses the cleaning of heat exchangers that have been placed at greenhouses throughout the Netherlands and whereby all kinds of cooling water, such as surface water (including ditchwater), are used at the secondary side. After some time this water creates a deposit in heat exchangers, as a result of which the capacity becomes insufficient. Due to the construction of the heat exchangers it is impossible to take a sample of the deposition in order to determine the nature and composition. The housing of the heat exchangers often consists of carbon steel with a copper finned pipe. Between the fins mutually and the housing there is little space, which makes inspection with an endoscope impossible. Cleaning is also complicated because of this construction. Since heat exchangers have been placed throughout the Netherlands, the composition of the deposition also differs. A large range of typical contaminations may be present in these heat exchangers: silt, organic material, iron oxides (rust), lime deposit (calcium and magnesium compounds) and silicates (silicon compounds). In order to be able to remove these contaminations, the heat exchangers have been cleaned through circulation, with different cleansing agents. During each phase various laboratory analyses are carried out in order to determine whether the contamination has been removed, and how much and which contaminations are still present.

The cleaning method has been arranged especially for this assignment and consisted of three phases:

1) A degreasing phase in order to remove organic material and silt, by means of an alkaline cleansing agent WB Alkaline HD.
2) An acid phase with Descalant HD (on the basis of inhibited hydrochloric acid).
3) A second acid phase with an inhibited hydrofluoric acid solution.

From the two heat exchangers the following contaminations were removed:
2.7 kg iron compounds
1.6 kg calcium (calcium carbonate)
0.2 kg magnesium carbonate
0.3 kg silicon compounds
0.3 kg silt/organic material

When they have been cleaned, the heat exchangers are built in again. After they were used their heat transfer was normal again, which also indicated that the cleaning method was successful.

This is a good example of a custom-made cleaning solution offered by Vecom.

Extensive analyses by the Vecom laboratory

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