

REVAQ CERTIFIED WASTEWATER TREATMENT PLANTS IN SWEDEN FOR IMPROVED QUALITY OF RECYCLED DIGESTATE NUTRIENTS

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Introduction

To ensure high quality of the digestate produced from anaerobic digestion of sewage sludge in Sweden, a certification system, called REVAQ, has been established. REVAQ is operated by the Swedish Water & Wastewater Association, the Federation of Swedish Farmers (LRF), The Swedish Food Federation, and the Swedish food retailer's federation, in close cooperation with the Swedish Environmental Protection Agency. Today, more than 50% of the Swedish population is connected to a wastewater treatment plant (WWTP) certified through REVAQ and the number is steadily growing. The work performed by the certified WWTPs is focused on removing the sources of heavy metals and other contaminants before they reach the WWTPs, and ensuring safe recycling of nutrients to agricultural land.

The goals of the REVAQ work are to:

- avoid unacceptable accumulation of metals or undesired organic substances on agricultural land in the long term
- have no accumulation of cadmium taking place from 2025
- reduce accumulation of non-essential substances to a maximum of 0.2% per year from 2025



Figure 1: At the top, the logo of REVAQ with the slogan “cleaner water – better recycling”. Below, a typical Swedish wastewater treatment plant, certified through REVAQ.

REVAQ certified WWTP

In 2008, the first 14 WWTPs were certified through REVAQ in Sweden. Today the number has increased to 39. Every year, more plants are joining and as mentioned before, more than 50% of the Swedish population is already connected to a REVAQ certified WWTP.

The plants certified through REVAQ should ensure that:

- the quality of the incoming wastewater is continuously improved
- information is available about the treatment methods used as well as the quality of the digestate
- the quality of the digestate fulfills the specified requirements.

When sewage sludge is produced in a WWTP it is important to keep track of the time period when it was produced as well as information on its origin. In Figure 2, sewage sludge collected at a specific location at a specific time is stored separately and clearly marked with a sign. This is important to be able to trace the origin of various contaminants.



Figure 2: Sewage sludge collected between September 2012 and August 2013 from a specific location in Sweden.

Sewage sludge – an excellent phosphorous source

One of the main drivers behind the creation of REVAQ is to increase the recirculation of nutrients in our society. Special attention is given to the limited resource phosphorous, but also nitrogen,

micronutrients and organic matter which are important components of fertilisers and which contribute to soil quality improvement. Today, mineral fertilisers containing 10,000 tonnes of phosphorus and manure containing 26,000 tonnes of phosphorus is used in the agricultural sector in Sweden. In 2013, the REVAQ certified digestate contained almost 3,000 tonnes phosphorous, out of which 1,300 tonnes was used in the agricultural sector. If the entire Swedish population were to be connected to REVAQ certified WWTPs and the acceptance for using WWTP digestate in agriculture is further improved, 50% of the mineral fertilisers could be replaced by digestate from WWTPs. Future prices of phosphorous are expected to increase due to diminishing availability. Therefore it is of vital importance to increase recirculation of phosphorous in our society in order to ensure future food production for the growing world population.



Figure 3: REVAQ certified digestate being spread onto agricultural land in Sweden.

Cadmium – one of the main challenges

Up to the year 2025, the aim is that the cadmium content in the digestate should be reduced to 17 mg/kg P or less. This is a very challenging target, but it is needed in order to avoid progressive accumulation of cadmium on agricultural land. This aim will be reached by eliminating the cadmium at its source, before it enters the sewage system.

Examples of cadmium sources that have been identified and eliminated are wastewater from landfills, airports and power plants. To find and eliminate cadmium sources requires not only a lot of investigations and analyses, but also information campaigns to promote better behaviour. As an example, a specific type of paints used by artists contains cadmium. Through information campaigns, artists using these paints are now aware of the problem and no longer flush paint residues down the sink and into the sewage system.

Figure 4 illustrates the progress of the work to remove cadmium from the digestate, by showing the distribution of cadmium levels in the digestate of the certified WWTPs 2011-2013. Around 70% of the plants had levels below 30 mg Cd/kg P in 2011. In 2013 that figure had increased to around 80%, so the development is moving in the right direction.

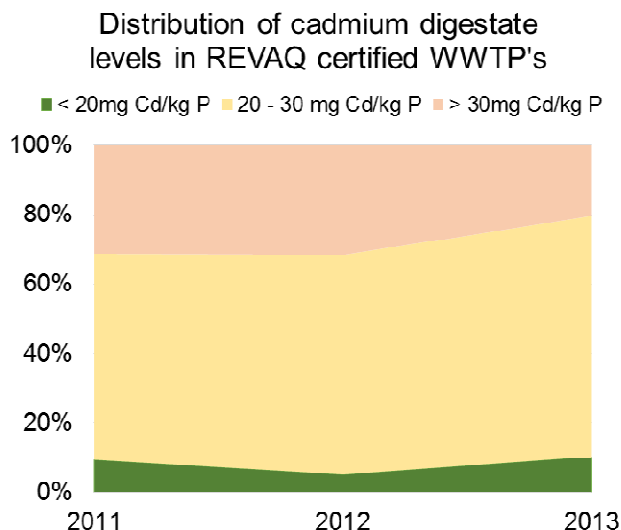


Figure 4: Distribution of cadmium levels in the digestate among the REVAQ certified WWTPs.

Similar progress is observed for other heavy metals such as silver, mercury and gold.

Removal of organic contaminants

The most efficient way to remove undesired organic substances from the sewage system, is to work for decreased usage of specific compounds at the source, e.g. industries. In the long term it is important to influence amendments to laws and regulations controlling what substances are allowed to be used by various industries and which eventually end in wastewater treatment plants. The certified WWTPs identify where undesired compounds are used, and in cooperation with the identified industry actors these compounds are removed from their process and, as a consequence, from the sewage system. The Swedish Chemicals Agency, which guides the WWTPs in their work, has a list of substances which use should be phased out by Swedish industry.

The WWTPs also have the right to express their opinion when new companies start up their activities in their area so as to avoid establishment of companies that will pollute the sewage. During 2013, many contaminating compounds have been removed. The general impression from the REVAQ work is that cooperation with the industries causing the pollution in the first place usually goes a long way to solving the overall problem.



Figure 5: It is important to remove non-biodegradable contaminants at the source, so they don't end up in the wastewater. At the wastewater treatment plant these contaminants are very hard to remove.

REVAQ brings increased confidence

The REVAQ certification system has shown that by implementing systematic, transparent and goal-oriented cooperation between key stakeholders such as farmers, food industry and food retailers, it is possible to:

- reduce hazardous contaminants from the urban water cycle
- increase sludge quality
- increase the recycling rate of nutrients and organic matter
- build confidence with both key stakeholders and environmental authorities

Concluding remarks

The Swedish REVAQ certification system was launched in 2008 to coordinate and strengthen the sludge quality work of WWTPs with respect to control and elimination of contaminant sources and putting down strict requirements on the reuse of nutrients in sludge on agricultural land. REVAQ certification is the result of a long-term cooperation between stakeholders in agriculture, the food industry, retailers and the water sector. Today, more than 50% of the Swedish population is connected to a REVAQ certified WWTP.

The REVAQ certification system has shown that it is possible to simultaneously build confidence, reduce contaminants and increase the recycling of nutrients and organic matter by implementing a systematic, transparent and goal-oriented cooperation between key stakeholders.

ADDITIONAL INFORMATION AND CONTACTS



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