

## Energy-Efficient Wastewater Cleaning through Vacuum Distillation

**Various processes are available for cleaning industrial wastewater. In the course of renewing a plant, Fulda-based JUMO GmbH & Co. KG has decided on vacuum distillation. In this particular process, in-house measurement technology is also used.**

Proven and known processes for wastewater cleaning are chemical-physical treatment and membrane filtration. In the former, various chemicals cause impurities to precipitate as solid matter. These then have to be disposed of separately. In membrane filtration, the cleaning process is carried out through membranes which are permeable to water.

Vacuum distillation is a comparatively new process, which is based on the principle of material separation according to boiling point differences. As the boiling point of the liquid that is to be separated is lower at a reduced pressure, even substances that would break down at higher temperatures can be separated. Vacuum distillation is mainly used in oil refining.

In the treatment of wastewater various substances such as heavy metals, salts, oils, greases, or tensides remain in the evaporation residues. As the proportion of water evaporates, the volume of residue from vacuum distillation is reduced to 0.5 to 5 percent of the original volume of wastewater. The rising water vapor is virtually free of impurities. After condensation, 99 percent of the process water can be put back into the production process. This, of course, saves a large amount of resources, and compared to other processes, also saves chemical substances in considerable amounts.

Since the plant uses the energy created during condensation of the steam directly for the evaporation, energy consumption is very low and the operation is very economically attractive.

At JUMO GmbH & Co. KG in Fulda, Germany the aim was to modernize an outdated wastewater cleaning plant for in-house electroplating. It quickly became clear that the upgrade would have cost around a quarter of a million euro. The project team therefore went on the search for an alternative, and came across the highly modern vacuum distillation plants of H2O GmbH from Steinen, Germany.

This company's plants particularly stand out in that they utilize various innovative processes to produce crystal clear distillates of considerably higher quality as an end product in comparison to common vaporizers. Here, the

quality of the distillate is so high that no or very little follow-up treatment steps are needed. Additionally, the systems automatically adjust to fluctuating process water qualities.

At JUMO the investment costs for the plant amounted to around 190,000 euro. In comparison to upgrading the old plant, 60,000 euro was therefore saved.

The plant can also now be controlled from a centralized location. Less staff is required for operation and fewer chemicals are used. What's more, the process is no longer subject to regulatory monitoring.

The "cherry on top" is that the new plant even uses JUMO technology for pressure, conductivity, or pH value measurements. The plants from H2O GmbH have special features even for measuring pH values. Common vacuum distillation systems set the pH value prior to evaporation. The disadvantage is that during the evaporation process, secondary reactions can be triggered which decrease the quality of the distillate. This can result in distillates with low pH values, which can cause corrosion damage. H2O GmbH has therefore developed a pH controller which compensates for these secondary reactions and thereby achieves a consistently good distillate result.

This controller does not measure the pH value at input, but rather in the cleaned distillate. If the pH values change, a neutralization agent is dispensed directly into the vaporizer to correct it. This way a consistent, stable distillate quality is achieved.

The combination of low costs, simple operation, and a very high level of flexibility ultimately led to JUMO deciding on vacuum distillation for wastewater cleaning of rinse water from the electroplating process.

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**Fig.1: The project leaders in front of the new plant.**





**Fig.2-4: JUMO sensors for measuring pressure, conductivity, and pH in the vacuum distillation plant.**



**Fig.5: The operating display of the plant.**