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SARATECH®

Substance removal with adsorption

The manufacture of pharmaceuticals frequently results in effluent being released when the production plants are cleaned. However, they can be removed from the wastewater by adsorptive treatment processes. SARATECH® adsorbents from Blücher are especially well suited for this task.

Figure 1. SARATECH® polymer-based spherical adsorbents.

The manufacturing of pharmaceuticals frequently results in effluent containing substances used in the production process which are released when the production plants are cleaned. Cleaning is required at the end of a batch and when changing to a different constituent or pharmaceutical ingredient.

To avoid releasing these substances into the environment, they can be removed from the wastewater by adsorptive treatment processes. Saratech adsorbents are especially well suited for this task. Saratech adsorbents possess high adsorption capacity for non-polar organic substances. In comparison to conventional activated carbon, their properties also allow them to adsorb a high level of polar organic substances.

Spherical adsorbents

The spherical adsorbents shown in Figure 1 are obtained from a synthetic raw material using a process developed and patented by Blücher. The constant high quality of the adsorbents is ensured by combining the use of a synthetic raw material in a precisely controllable production process. It is also possible to customise their pore size distribution and to achieve inner surface areas of up to 2,100 m^2/g by

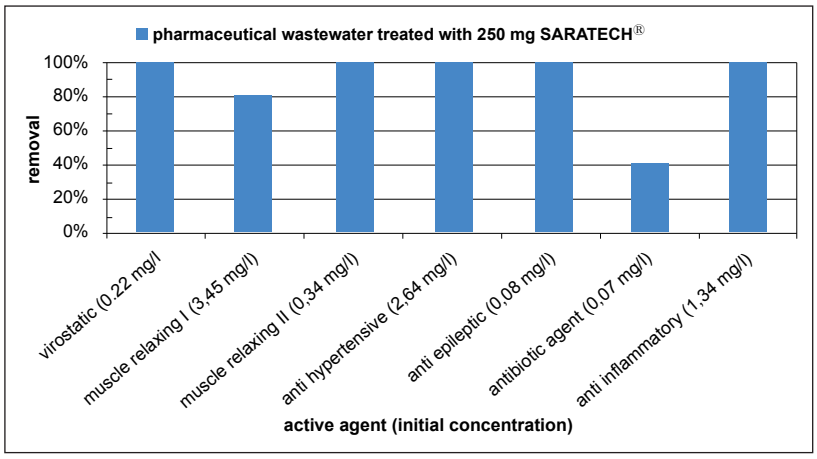

Figure 2. SARATECH® adsorption performance for seven different pharmaceutical substances.

controlling the production process, giving them an extraordinary high adsorption capacity. The adsorbents possess high mechanical stability. This prevents material abrasion and the ensuing formation of dust. The stability of the adsorbents allows them to be regenerated many times with a low loss of material.

The water treatment applications of Saratech adsorbents are used to remove micro-pollutants from drinking and waste water (e.g. pharmaceuticals and pesticides) and to eliminate residual organic pollutants in ultra-pure water treatment. Their suitability for the treatment of pharmaceutical waste-water is observable by the high degree of elimination which is achieved for many different pharmaceutical substances.

An external laboratory (Water Technology Centre, Karlsruhe) conducted static tests on the waste water of a pharmaceutical company and a Saratech type. As Figure 2 shows, very high degrees of elimination were achieved for five of the substances tested. In only one case the substance was not so easily removable.

By means of an example project, the application of Saratech adsorbents in the treatment of pharmaceutical waste-water will be further described in this article. During all phases of this project, Blücher provided its support to a pharmaceutical manufacturer. The service which Blücher provided included: process design, pilot trials, installation and commissioning of the full-scale plant as well as support in operating and servicing the plant including the replacement of adsorbents, continuous plant monitoring and data evaluation.

Full-scale plant

Waste water from pharmaceutical production is a mixture of several pharmaceutical substances and cleaning agents used to clean the production reactors. This presents a special challenge when designing an adsorption plant. Removing a substances with adsorbents depends on the specific properties of the substances. The suspended substances compete in a mixture for the adsorption space available. As a result, the adsorptive elimination of a substance is highly dependent on water composition and not readily predictable.

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Normally, suitable adsorbents are first selected in laboratory tests which determine the adsorption isotherms. Breakthrough curves are then identified in small filters. However, the data generated is still not sufficient to design the process in the adsorption plant.

For this reason, the mobile pilot unit (Figure 3) developed by Blücher is used at the customer's site to verify the feasibility and obtain the design data required. Mounted on a stand with steerable castors. It is ready to connect at its site of operation due to its small footprint (approx. 1m^2), an empty

Figure 3. The universal SARATECH® pilot plant closes the gap between laboratory trials and industrial application.