

Introduction to the New Filtration Technology with Re-generable Filter aids - Altenburg Brewery

Part 1: System Technology

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The standard procedure in the filtration of beer is the precoat with D.E. (Diatomaceous Earth). The filtration characteristics of D.E., such as its capacity for adsorption, separation and retention, consumption, and its cost effectiveness, are the basis for its application as filter aids media. The filter aids will be used one time and then disposed of. 90,000 tons of diatomaceous earth slurry is generated in German breweries each year.

Up until recently, the handling of D.E. was not a problem. The slurry was mixed with the spent grain or deposited in landfills. However, under the latest guidelines of the Animal Feed Laws, the addition of a slurry mix to spent grain to be used later as feed is no longer possible.

Disposal of D.E. slurry into the sewage system is forbidden because almost all community sewage regulations ban the dumping of solids into the sewage system. In addition, disposal of the slurry mix in landfills is hardly practiced because of the inability to meet the required conditions for disposal.

Beginning July 2005, waste disposal in Class I and II landfills will be impossible due to new standards in the Waste Disposal Regulations (Abfallablagungsverordnung - AbfAbIV).

The most common way to dispose of the slurry left over by the filtration process is by composting it so that it can later be used as fertilizer in farming.

Although the current fertilizer guidelines still allow for the use of D.E. slurry for fertilizing purposes, it is feared that this situation will not last and disposal of the D.E. slurry will become increasingly problematic.

The research project sponsored by the Deutschen Bundestiftung Umwelt-DBU (a German foundation which promotes innovative environmental projects), Pall GmbH SeitzSchenk in cooperation with BlfA, the Altenburg Brewery and the University of Hohenheim, developed a procedure in which it is not necessary to completely dispose of filter aids after filtration. It is now possible to re-generate and recover the filter aids with the help of enzymes and/or acids and caustic which can be introduced into the filtration.

In mid 2004 this newly developed technology with its corresponding technique was built and put into operation at the Altenburger Brewery in Altenburg. Along with implementation and validation, a comprehensive efficiency study and ecological assessment were created for this project.

Altenburg Brewery

The Altenburg Brewery was established in 1871. The first batch of the Altenburg Brown Beer was brewed in June of 1873. Targets were already met in the first business year with an output of 30,000 hl which, in the second business year, climbed to over 60,000 hl due to the extraordinary quality of the Altenburg beer. The planning of one of the most modern breweries in Europe begun in 1912 and was subsequently built in 1913. The brewery was completed and put into operation in 1914. During World War II, output decreased to below 70,000 hl and in 1949 amounted to a mere 30,000 hl including alcohol free beverages. In July 1948, the brewery was nationalized. Until 1990, 330,000 hl of beer and alcohol free beverages were produced each annually.

In 1990, the brewery became a trust company and a changing phase begun. First, a cooperation contract was signed with the Erste Kulmbacher Aktienbrauerei.

In May of 1991 the brewery was privatized and the Leikeim family from Altenkunstadt took over. At that time, the output was a hopeless 10,000 hl. Targeted investments led to an improvement of the quality standards and to consistent increases in turnover.

Between the years 2000 and 2003, the consistent sales numbers (around 200,000 hl) led to the modernization of the brewhouse. This modernization included twelve new fermentation and storage tanks. The old swing-top or flip-top bottle also played a big role in the success of the company.



The Altenburg Brewery was the first to reintroduce this tradition. Today, the following beers are produced in the Altenburg Brewery GmbH: Altenburger Premium, Altenburger Lager, Altenburger Schwarze, Altenburger Festbier and Altenburger Radler and Black Radler, all distributed either in flip-top bottles or barrels.

Planning and Integration of the new Filter Lines

Working closely together, the Altenburger Brewery and Pall GmbH SeitzSchenk defined and determined the responsibilities for the integration of a 250hl/h Primus III filter line with re-generable filter aids. Timetables and flow sheets were created and the existing grounds of the former refrigeration room were examined.

Due to an exact time line regarding the start-up of the new re-generable filter line and the decommissioning of the old filter system, there could be no room for production failures.

Assembly of the Filter Line with re-generable Filter aids

The new filter line with re-generable filter aids was assembled in June of 2004 and was integrated to the existing operation. Pall GmbH SeitzSchenk was in charge of the operation.

The filter line includes the following components:

- 50 hl buffer tank unfiltrate
- D.E. mixing station
- ZHF Primus III C 50 with 50 m² filter area
- Insulated storage tank for the re-generated filter aids
- Dosing station
- Particle filter with 19 particle filter cartridges
- 20 hl buffer tank filtrate
- 3 tanks, CIP for hot water, cold water and hot caustic
- Dosing station for caustic, acid, disinfectant and enzymes.

ZHF Primus III

Precoat filtration with D.E. is still the most flexible, efficient, and economic technology in beer filtration. The centrifugal-horizontal pressure leaf filter (ZHF) Primus III, equipped with the filter support Durafil® is the preferred system for filtration technology based on precoat filtration with re-generable filter aids.

The filter vessel volume ratio to metal filter area plays an important role in the running operational costs. A compact construction implies less dead volume. The greater the ratio, the greater the operational costs (Water, Sewage, Caustic, Acids, Enzymes). The filter vessel volume ratio to metal filter area depends on the construction size, and with the (ZHF) Primus III it lies between 0.5 – 0.75.



Filterline with the ZHF Primus III D.E. filter for re-generable filter aids, and the storage tank as well as CIP Tank in the Altenburg Brewery

System Specifications of the ZHF Primus III C50 D.E.Filter for Re-generable Filter aids

Filter vessel volume:	3.65 m ³
Max. vessel pressure:	9 bar
Filter area:	50.6 m ²
Capacity:	150 – 250 hl/h
Max. D.E. input:	550 kg
Ratio vessel volume/filter area:	0.73
Filter support:	Durafil®
Filter aids :	re-generable filter aids

Insulated and heat resistant storage tank for re-generable filter aids with 4500 liter content.:

- Sterility achieved by maintaining the total suspension heated (also in down times)
- Agitator
- Hose type dosing pump , frequency controlled, flow controlled dosing
- Full automation
- Filter drive, frequency controlled 22 kW motor
- Beer feed pump, frequency controlled
- Turbidity control with Sigrist, Dualscat 90°/25° - turbidity meter
- Valves make Kieselmann

Automation

Pall GmbH SeitzSchenk was responsible for the automation of the entire filter line and the process peripherals such as CIP, D.E. mixing station, and electrical installation.

Programming, control panel, electrical assembly and commissioning were the scope of the order. The filter line is operated by Siemens S7 Control Equipment.

Commissioning

After different dry and wet tests, such as cleaning of the entire system, the filter line with re-generable filter aids was put into operation mid June 2004. Since then, 100% of the Altenburg beer is filtered through the new filter line with re-generable filter aids.

Re-generation of the Filter aids

After filtration, the filter aids are re-generated in the ZHF filter. Subsequently, the filter aids are suspended again in the storage tank and introduced into the running dosage for the following filtration. With this process, the brewery saves about 70% of its annually filter aids consumption.

The results of the filtration and re-generation process will be shown in the 2nd part (Project Results), and will be presented at the EBC Congress on May 17th in Prague.

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The decision to install a prototype in such an important step of the process such as filtration, indicates the great courage that the management from the Altenburg Brewery has demonstrated in times of great pressure from the competition. This decision must be highly acknowledged.