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## **Modern applications of pressure filtration for bauxite and red mud filtration**

Continuous pressure filtration uses rotary disc and drum filters that are installed inside a pressure vessel. Thus, the continuous pressure filtration - also known as hyperbaric filtration - combines the advantages of continuous rotary vacuum filters with the benefits of a high filtration pressure difference of up to  $\Delta p = 6$  bar. The high capacity and cost efficiency of this technology, developed in the early 1980s at the University of Karlsruhe in Germany, have ensured its success for the filtration of fine-particle bulk materials. Typical applications are found in coal preparation and iron ore beneficiation, starch production as well as in fine chemicals. The most modern variant of this separation technology is Hi-Bar Filtration which is also available as patented steam pressure filtration. This process in particular offers great potential for innovative applications. In alumina refineries modern pressure filtration offers new possibilities for the dewatering of bauxite and red mud.

Bauxite dewatering is necessary when bauxite is transported to the refinery via pipeline and in case of diasporic bauxite that has to be treated before the digestion. In both cases bauxite is milled and slurried with water to attain a slurry that is suitable for pipeline transport or for treatment, respectively. The bauxite has then to be dewatered to a certain moisture content below a critical value in order to

- keep water input in the refinery minimal (which is critical to the water balance of the plant)
- avoid sticky behavior i.e. to attain good transportation characteristics
- enable blending of the dewatered bauxite with other bauxites.

Therefore, mechanical bauxite dewatering is a decisive process step that needs a high performance filtration process due to

- large mass throughput
- required low moisture content of  $\leq 14$  wt%
- wide distribution of the solids with large amount of fines (e. g.  $x_{20} < 8 \mu\text{m}$ ).

Discontinuous filter presses, membrane filter presses and belt filters need long cycle times and therefore large filter areas to attain the required cake moisture. With the continuous pressure filtration, however, the required low cake moistures are achieved with large specific throughput rates what keeps the required filter area small. A first filter plant for dewatering of pipeline-transported bauxite has now started operation in Brazil. This hyperbaric filter plant was realized in a consortial cooperation and consists of five pressure disc filters with  $168 \text{ m}^2$  filter area each. The filters achieve a solids throughput of 480 t/h and a moisture content of  $mc < 14$  wt-%.

Hi-Bar steam pressure filtration is capable of washing and drying the red mud to such an extent that a recycling of this residue is possible. Hi-Bar steam-pressure filtration produces a bulk-like material, characterised by:

- free flowable, sand-like bulk behaviour,
- moisture content  $mc = 21 - 23$  % (depending on the origin of bauxite and the aimed process result and the further usage, respectively),

- content of soluble soda  $c_{\text{Na}_2\text{O}} = 0.2 - 0.4 \text{ w-\%}$  (depending on the wash water amount, origin of bauxite, further usage, etc.)

In a German Alumina refinery a Hi-Bar pilot plant using Steam Pressure Filtration has been operated for weeks to produce a big amount of dry red mud under industrial conditions.

**The lecture presents the continuous pressure and steam pressure filtration and reports on the plant and process design of the hyperbaric filter plant for bauxite dewatering. Furthermore the red mud filtration with Hi-Bar steam-pressure filtration and the possibilities and conditions of red mud re-usage are presented.**