

SEPARATION OF NANO PARTICLES USING BOKELA's DYNO FILTER

The dynamic Cross Flow Filtration — the solution for a highly topical challenge

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Suspensions and dispersions containing nanoscale particles are becoming an increasing challenge in the field of separation technology. As a part of the process technology, the separation techniques are therefore confronted with a completely new and unusual task profile. The filtration of these kinds of suspensions is consequently an especially ambitious and a highly relevant mission.

The traditional separation procedures, such as cake forming filtration and centrifugation, operate mainly within the micron spectrum whereby forces of gravity determine primarily the prevailing separation physics. In the sub-micron spectrum, however, the micro filtration and ultra-filtration procedures are applied in great variety besides some adapted traditional separation technologies. For these sub-micron suspensions the separation physics are more determined by phenomena arising from surface forces. Dipole behavior and other influences deriving from chemical processes such as zeta potential, isoelectric point, etc. are dominating and the traditional separation theories are only partially valid. Not only the separation behavior of nanoscale suspensions is changed but also the aim of the separation procedures is a different one in the sub-micron spectrum. In this context, excessive dewatering or even total de-liquoring is not permissible. Therefore, these tasks require separation procedures with innovative and unusual profiles.

The BOKELA DYNO Filter, however, provides new opportunities. Both, the process and apparatus of the DYNO Filter fit almost perfectly to the requirements of nano-scale suspensions. The Dynamic Cross Flow Filtration has been known and been applied for rather a long time. BOKELA, however, developed this filtration process into the new DYNO Filter and thus, discovered completely new solutions by an innovative process design. Thanks to the filtration of nano-scale suspensions, the DYNO Filter is now entering an especially challenging and promising area of applications.

The dynamic Cross Flow Filtration, obtained excellent results. In order to solve the given task, a DYNO Filter with a 6 m² filter area and equipped with a polymer membrane is required. With an initial particle concentration of 7% of the total weight, the nano particles are thickened up to a concentration of 23% in the DYNO Filter and undergo a washing procedure afterwards. During this stage, a 1.000 fold reduction of the ion concentration is obtained. As a consequence, the pH value is reduced from 14 to the targeted value of 11. At the same time, an entire separation of particles is achieved whereas the filtrate is turned into a solids free liquid. At slightly lower throughput rates, a concentration up to 40% can be obtained.

Further nano-scale suspensions used in the chemical, pharmaceutical and pigment sector as well as in the area of environmental protection, were examined on their processing characteristics in BOKELA's large-scale tests. The results have proved not only the feasibility but also the superiority of the Dynamic Cross Flow Filtration with the DYNO Filter compared to other separation processes: an entire separation of particles, high filtrate flows, high thickening concentration, and excellent washing results.

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Extensive Field testing with the BOKELA DYNO filter for different nano-scale suspensions used in the chemical, pharmaceutical and pigment sector as well as in the area of environmental protection, was conducted. The results have proved not only the feasibility but also the superiority of the Dynamic Cross Flow Filtration with the DYNO Filter compared to other separation processes: an entire separation of particles, high filtrate flows, high thickening concentration, and excellent washing results.