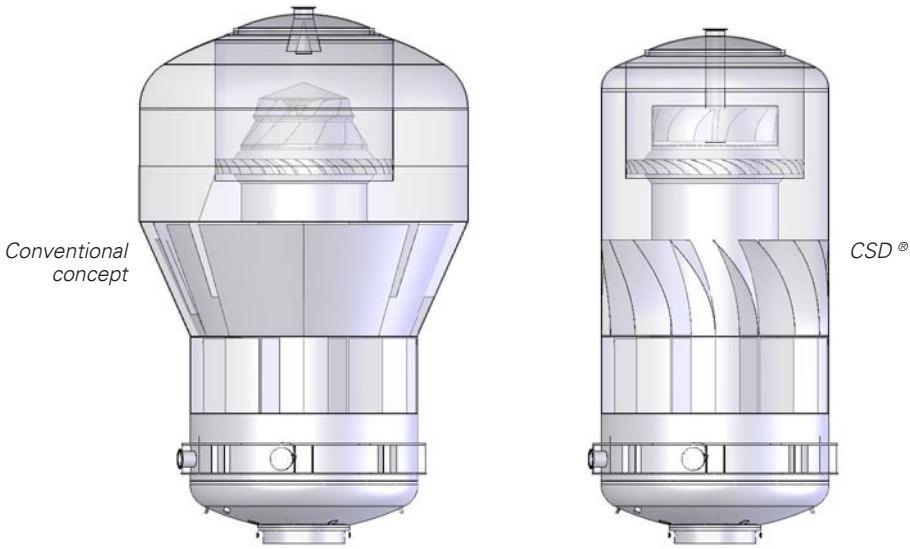
CSD® – BMA's novel steam dryer

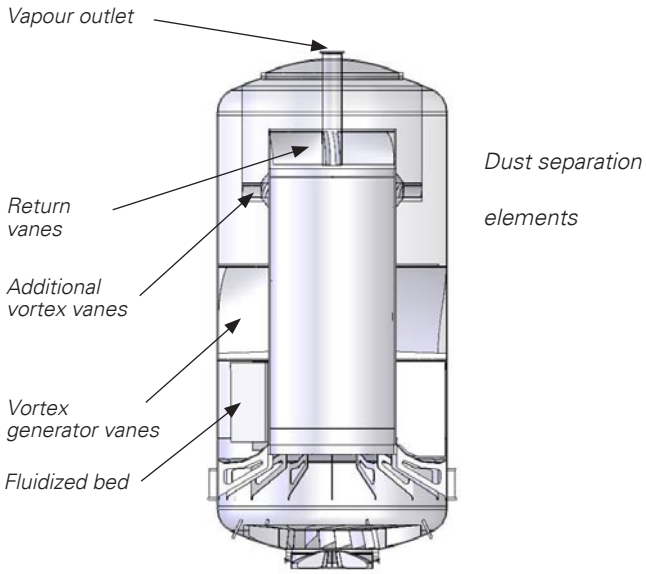


Sizes conventional concept – CSD® compared

Steam dryers have been state-of-the-art technology for some time, and many sugar factories use these dryers for drying beet pulp. A major criterion for installing steam dryers is the substantial energy savings potential they offer in comparison with conventional dryers, and the continuing rise in primary energy costs will give added weight to this potential. On the other hand, there is a growing demand for even more efficient steam dryers, to be able to handle the high capacities of modern sugar factories. In terms of size, current steam dryers will soon reach their technical limits. But instead of simply scaling up its present steam dryer versions, BMA decided on a completely new approach and can now present a new dryer with yet improved performance figures.

After thorough analysis of the present steam dryer design, and making extensive use of CFD (Computational Fluid Dynamics) computations, BMA has developed a new steam dryer concept. The illustration on the left shows BMA's conventional size-12 steam dryer with a maximum water evaporation of 56 t/h (62 sht/h). Although the evaporation rate is the same, the new BMA dryer (on the right) features a much more slender design. Since the new dryer has special vanes installed above the fluidized bed to create a vortical flow pattern, the cost-intensive conical extension typical of the conventional dryer version is no longer necessary. The completely cylindrical outer contour has given the new dryer its name: Cylindrical Steam Dryer - CSD®.

In the new dryer, a free space has been created between the vortex generator vanes and the additional vortex vanes at the dust separator intake end. Unlike earlier designs, the new version does not have any flow-impeding elements in this region, so the entire space is available for an unrestricted vortical flow of steam. Centrifugal acceleration thus forces large particles entrained with the upward flowing steam against the outside wall, from where they drop back into the fluidized bed.



Because of the distinct vortical flow created in the CSD dryer, the steam flowing upwards from the different cells of the fluidized bed is mixed intensively before it enters the dust separator. This provides for a homogenized steam flow and hence smooth dust separator operation. The separated dust leaves the steam dryer through a duct on the circumference of the outer shell, from where it passes into a lateral cyclone. From this cyclone, the dust can be returned to cell 16 for remixing with the dried pulp.

As part of CFD calculations, the entire dust separator system integrated in the dryer (with vortex generator vanes, additional vortex vanes, and return vanes) has been redesigned for optimized flow properties.

The fluidized bed itself is dimensioned on the basis of the tried-and-trusted fluidization conditions applied in earlier BMA dryers. Although increasing the velocity of the circulation steam is a method that can be used to raise the specific capacity per dryer volume, this solution has disadvantages for the system operator in the long run. Higher steam velocities result in intensified product destruction and a higher dust percentage, as well as an increasingly abrasive effect on the dryer installations, in particular produced by the dried pulp and the sand that is carried along.

Owing to the purely cylindrical contour of its outer shell, the largest steam dryer can be built with an outer diameter of ten metres. This dryer features an unprecedented 75 t/h water evaporation rate, which corresponds to an average beet slice rate of more than 16,000 t/d.

Dr. Lothar Krell

Benefits

- Maximum water evaporation rate of 75 t/h plus
- Lower investment cost
- Reduced footprint and reduced volume thanks to cylindrical dryer design
- Easier installation