Abstract for oral presentation
AFS + AIchE Meeting, San Antonio, Tx, March 2010.

Applicational design and sizing of Decanter Centrifuges:
Different approaches to achieve optimum performance

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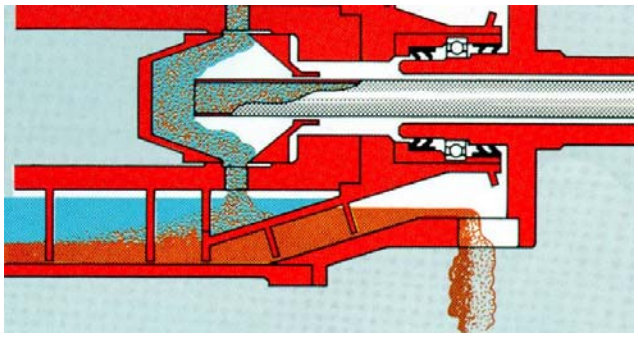
Abstract:

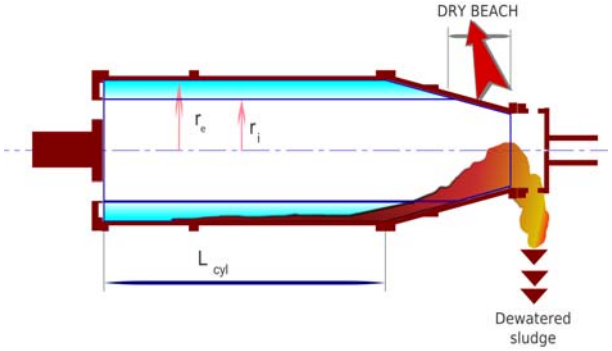
More than 2.000 applications where Decanter Centrifuges are used to separate solid particles from a liquid or simultaneously separate two immiscible liquids and a solid are listed in relevant literature.
Of course a number of those applications are in a way exotic, are niche applications. Others are really volume applications e.g. sludge thickening and dewatering, process-integrated recycling of valuable material and juice production.
It is very obvious that the wide variety of applications implicate the need of significantly different Decanter Centrifuges in terms of individual features / design and size.

Following the feed flow from entering into the feed-tube down to the liquid outlet on one hand and the solids movement caused by the conveyor, we come across all critical aspects of state-of-the-art Decanter design and sizing:

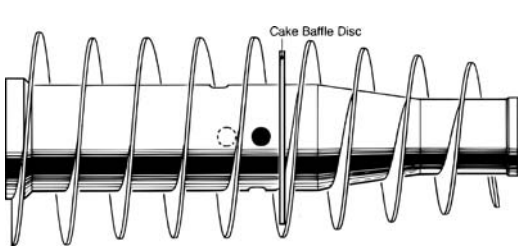
- The inlet zone:
  This is the spot where the feed suspension is mainly accelerated to reach bowl-speed. The occurring energy dissipation acts on the droplet- and particle size, thus influencing the separation behaviour of the suspension. Here a “low-shear” design significantly helps to minimize droplet and particle degradation and enables for smooth and sufficient acceleration.

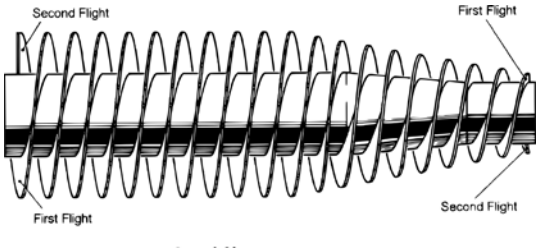


- The bowl design:
  Of course the bowl design consist of more than the diameter, the length and the half-cone angle. Different applications demand quite different L/D ratios and pond-depths. The sizing, means how “big” the machine is, is usually based on pilot tests and scale-up theories, e.g. the equivalent settling area (Sigma).
  In many case only the combination of those theories based on experience results in a good performance. Looking only to the Sigma theory, 7 different equations exist to calculate and compare the Sigma-value of one given machine. The results differ in the range of factor 2

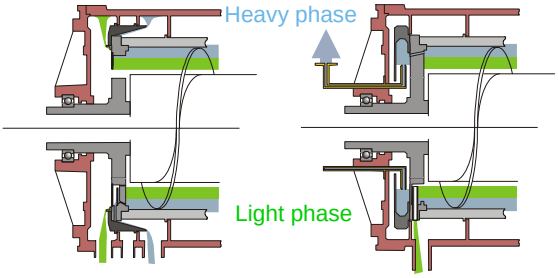


- The conveyor design
  The conveyor is the heart of the Decanter. Its design is crucial to facilitate appropriate solids transport and solids conditioning, e.g. dewatering.
  Quite a number of individual, application oriented features are used to reach the demanded performance in terms of both, cake and centrate quality.
  Predominantly these are “baffle-discs”, “floater-discs”, decreasing / increasing pitch quasi-axial flow configuration.
  In combination with the baffle-disc design the so-called negative operation is beneficially used in numerous applications





- The liquid outlet
  The liquid outlet could differ a lot with the application.
  In many cases a simple weir overflow is totally sufficient. Other applications demand a automatic adjustment of the overflow height by means of an adjustable paring device, i.e. paring disc or tube. Especially within the area of 3-Phase separation facing alteration in feed composition or phases-properties, the adjustable paring device is a superb tool to achieve optimum performance.



On first sight, a Decanter Centrifuge may appear as a “simple” machine consisting of a rotating bowl and a conveyor rotating with differential speed. The “turbulent” journey, moving with the flow from the inlet to the outlet has shown that a lot of thoughts must be spent to appropriately design and size this machine to reach the goal: demanded cake and centrate quality.

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