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Crystallization, Separation, Purification

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Armstrong Chemtec Group
USA SCOTLAND SINGAPORE NETHERLANDS

HYDRAULIC WASH COLUMN

Efficient Solid-Liquid separation is the key to high purity

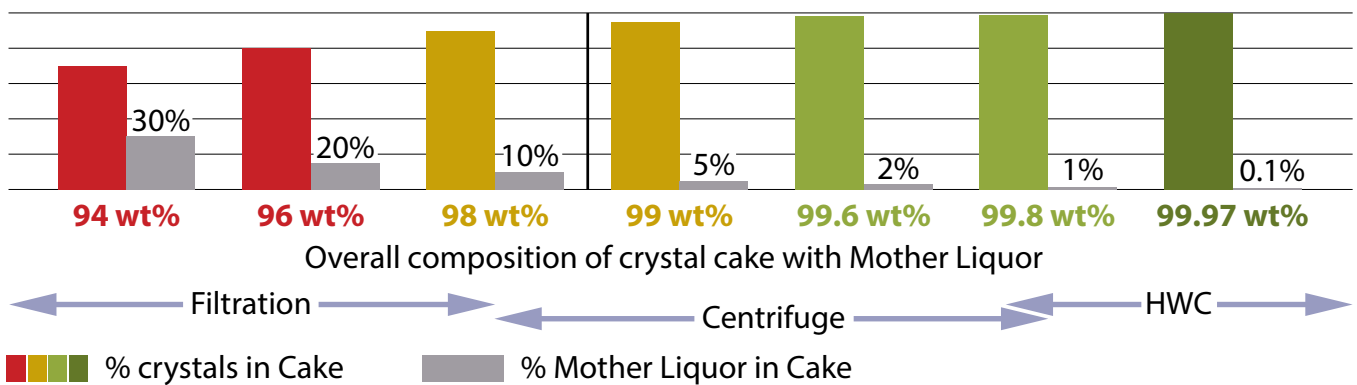
Effect of solid-liquid separation on purity of the product

The Feed suspension

An impure feed has been crystallized. The suspension contains crystals with a purity of 99.99 wt% and the Mother Liquor (ML) has a purity of 80 wt%. This suspension is separated in a filter, centrifuge and the Hydraulic Wash Column.

	Filtration	Centrifuge	HWC
Filter cake composition	70-90% crystals 30-10% ML	90-99% crystals 10-1% ML	99-99.9% crystals 1-0.1% ML
End product purity	94-98 wt%	98-99.8 wt%	99.8-99.97 wt%
Possible Additional measures	Washing	Washing	Not needed

(Example: $(99.99 * 70\%) + (80 * 30\%) = 69.993 + 24.000 = 93.993$, rounded off to 94%)

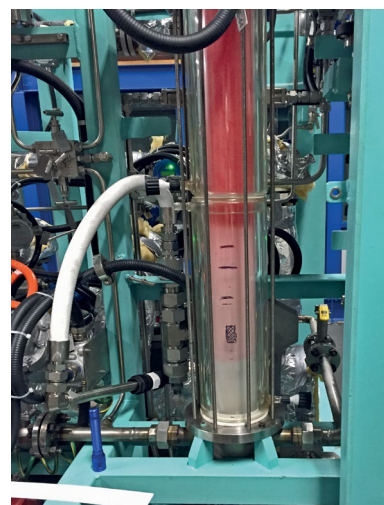


Very high product purity possible in HWC due to extremely low amount of ML in the crystal cake

Case study with para-xylene (PX) at SoliQz

	Centrifuge	HWC
% PX in end product	99.47 wt% (avg)	99.88 wt%
% PX in ML	88.93 wt%	79.51 wt%
Impurities in end product	0.53 wt%	0.12 wt%
Impurities in ML	11.07 wt%	20.49 wt%
Distribution coefficient	0.048	0.0059

Distribution Coefficient k_d = impurity concentration in product divided by impurity concentration in ML



Proven and potential applications

Melt Crystallization - Hydraulic Wash Column has been proven for about 60 different products on at least pilot plant scale. Table presents a few examples. Another 400 products are on the list of potential applications.

Compound	[Impurity] Mother Liquor	[Impurity] Product	Distribution coefficient
Para-xylene	10.8 wt%	0.07 wt%	0.006
Acrylic acid	4.8 wt%	0.04 wt%	0.008
Para-dichlorobenzene	5.98 wt%	0.025 wt%	0.004
Maleic anhydride	4.03 wt%	0.03 wt%	0.007
Naphtalene	10.0 wt%	0.02 wt%	0.002
Ice/MgSO ₄	27.7 g/l	0.032 g/l	0.002

Purification by Melt Crystallization and HWC is versatile: similar and high purification for different products with different crystals and different physical chemical properties.

HWC is much more efficient as Solid-Liquid separator than filters or centrifuges