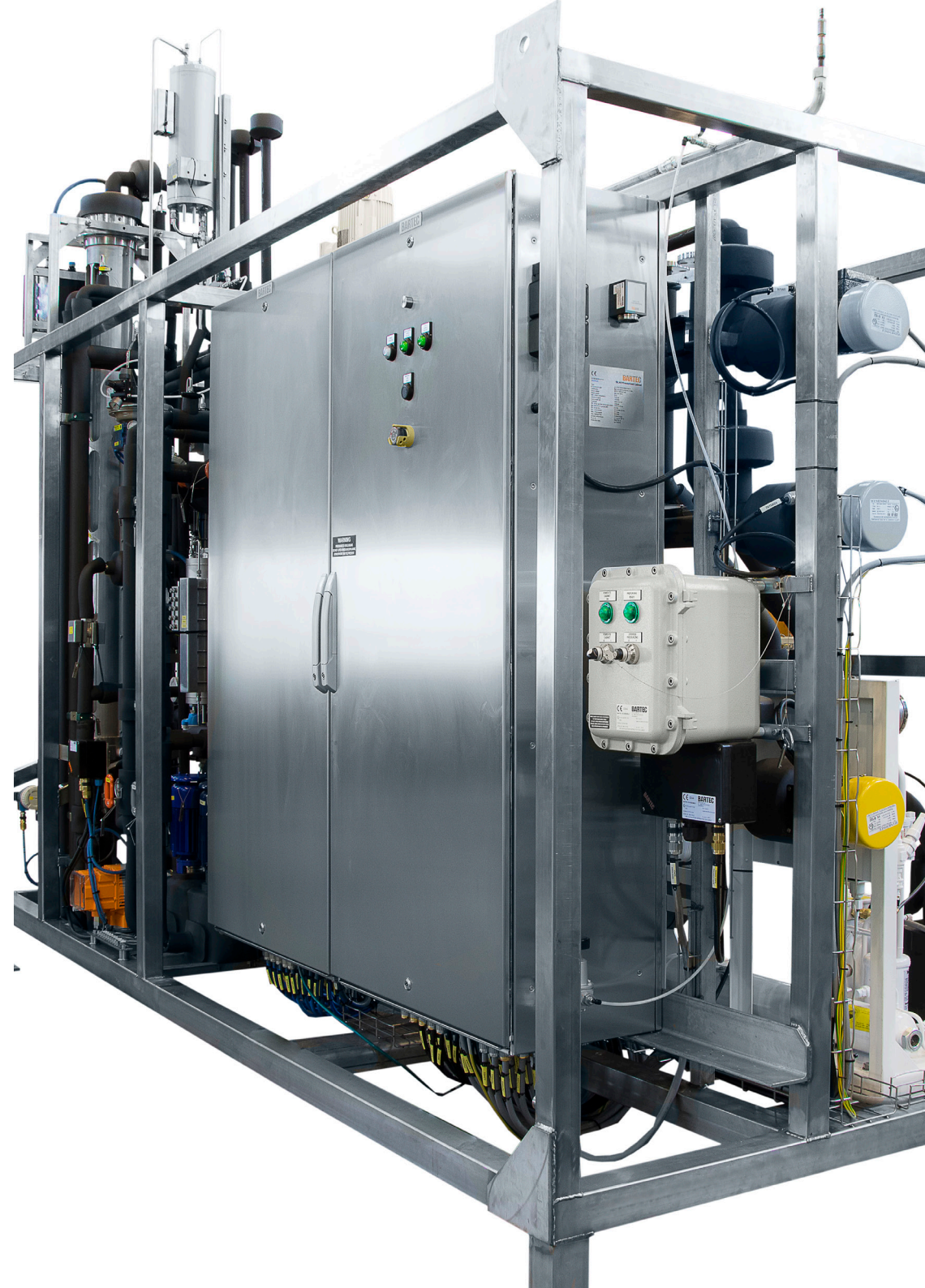


# CHEMICAL PILOT PLANTS

Suspension Crystallization and  
Wash Column Separation



## Tested applications

Product	Formula	CAS No.	Mol. Wt.	Tboil (°C)	Tmelt (°C)
p-phenylenediamine (pPDA)	C6H8N2	106-50-3	108.2	267.0	141.4
p-diiodobenzene	C6H4I2	624-38-4	329.9	285.1	129.5
benzoic acid	C7H6O2	65-85-0	122.1	249.0	122.4
p-tert butylphenol	C10H14O	98-54-4	150.2	233.9	98.9
L-Lactide	C6H8O4	4511-42-6	144.1	264.7	98.7
p-Nitrochlorobenzene	C6H4NO2Cl	100-00-5	157.6	242.0	82.5
naphthalene	C10H8	91-20-3	128.2	298.2	80.3
Durene (tetramethylbenzene)	C10H14	95-93-2	134.2	196.8	79.2
Stearic acid	C18H36O2	57-11-4	284.5	361.1	69.5
Caprolactam	C6H11NO	105-60-2	113.6	268.0	69.2
isosorbide	C6H10O4	652-67-5	146.1	372.1	62.5
Mono chloroacetic acid (MCA)	C2H3ClO2	79-11-8	94.5	189.0	61.2
m-phenylenediamine (mPDA)	C6H8N2	108-45-2	108.2	286.9	60.9
Stearin	C57H110O6	555-43-1	891.5	813.0	60.0
o-Phenylphenol (OPP)	C12H10O	90-43-7	170.2	282.0	57.5
p-dichlorobenzene	C6H4Cl2	106-46-7	147.0	173.0	53.1
Maleic anhydride	C4H2O3	108-31-6	98.1	200.0	52.0
2-Coumaranone	C8H6O2	553-86-6	134.1	248.8	49.5
3,4 dichloronitrobenzene	C6H3Cl2NO2	99-54-7	192.0	255.6	42.9
MDI - 4,4'	C15H10N2O2	101-68-8	250.3	392.0	40.4
Ethylene carbonate	C3H4O3	96-49-1	88.1	248.0	36.4
dicyclopentadiene	C10H12	77-73-6	132.2	167.9	32.0
Phosphoric Acid (hemi-hydrate)	H3PO4-½H2O	7664-38-2	107.0	180.0	29.3
Vinylene carbonate	C3H2O3	872-36-6	86.1	178.0	22.0
Toluenedisocyanate (2,4 TDI)	C9H6N2O2	584-84-9	174.2	120.0	21.8
Acetic acid	C2H4O2	64-19-7	60.1	244.2	16.7
Methacrylic acid	C4H6O2	79-41-4	86.1	163.0	14.4
Acrylic acid	C3H4O2	79-10-7	72.1	139.0	13.5
N-vinyl-2-pyrrolidone (NVP)	C6H9NO	88-12-0	111.1	92.0	13.5
p-Xylene	C8H10	106-42-3	106.2	138.5	13.3
p-Chlorotoluene	C7H7Cl	106-43-4	126.6	162.0	7.6
γ-picoline	C6H7N	108-89-4	93.1	144.9	3.7
Hydrogen Peroxide	H2O2	7722-84-1	34.0	108.0	-0.4
Ethyl lactate (S)	C5H10O3	687-47-8	118.1	154.0	-2.7
3,5 dimethylpyridine	C7H9N	591-22-0	107.2	172.0	-6.5
Acetonitrile	C2H3N	75-05-8	41.1	81.5	-44.5
m-Xylene	C8H10	108-38-3	106.2	138.5	-47.9



## The W6 chemical pilot plant

The W6 Chemical pilot plant is used to provide product and operation data for a specific application. It consists of a scraped surface drum crystallizer and can be configured with either a piston or hydraulic type wash column as separation unit. A secondary refrigerant circulating in the outer jacket of the drum crystallizer provides the cooling for crystallization. Three primary refrigeration systems are available providing an operational range between -50°C and +150°C. The unit is provided as a self-contained skid including all process, control and refrigeration components. Designed according to EC Directive 2014/34/EU (ATEX) and built based on industrial components, the W6 can be operated in practically any location. Whether for initial feasibility or by extended trials the W6 can provide sufficient information to scale up to industrial capacities and at the same time will demonstrate the robustness and range of the GEA suspension-based crystallization process on your specific application.

# TESTING YOUR APPLICATION

## Typical test run on an organic chemical

When actual data is not available, estimates for binary mixtures can be quickly obtained and are generally accurate in the area of concern. With this basic information we can plan the initial test work. Our engineers will review the test goals with the client and ensure the test works can be completed safely. Typical test goals will be to demonstrate stable operation, determine product purity and the separation efficiency of the washcolumn. Additionally, we can further concentrate the impurities to determine the lower limit (a eutectic of the solution) where suspension crystallization is still viable. During the test we collect product samples over the target temperature range for analysis. Operation conditions for the crystallizer and wash column are recorded and based on these results we can scale up and generate a design for the industrial plant. A typical test program can take 2-5 days, using 100-200 kg of crude depending on the feed material and test goals.

The W6 pilot plants are based on industrially relevant components. Most commercial products can be purified in one or maximum two-stage system, the single stage W6 can be operated in two steps to simulate this two-stage process so the results can be directly scaled to the target capacity. The pilot system is inherently a batch operation but true

continuous steady state operation can be demonstrated by recycling the product and reject back to the feed tank or operated in a pass-through mode as a mini production plant, typical capacities are 5-20 kg/h of crystal production. The W6 line provides a versatile and convenient method to demonstrate the GEA process on a wide variety of feed stocks with an operation range of -50°C to +150°C.

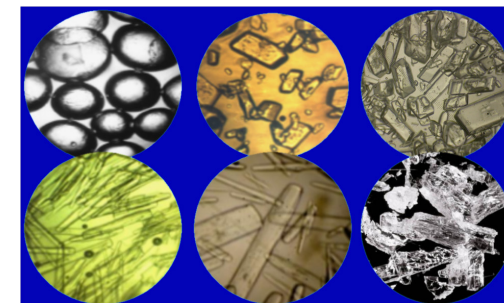
## Features

- Industrially relevant hardware
- Reliable scale up from pilot to industrial
- Ultra-high purities possible
- Simulates steady-state operation

Suspension-based melt crystallization can be demonstrated on a wide variety of chemicals with operating temperatures between -50°C to 150°C. Most tests are completed at GEA's site in the Netherlands. In special cases, when required, the pilot unit can be transported and testing completed at client's site. The skid mounted unit conforms to the applicable European standards for equipment design and ATEX Directive 2014/34/EU according to zone requirements for Ex II 2G Gb IIB T4.

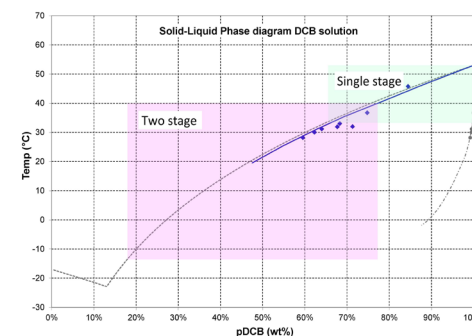
## Crystal types

The wash column can separate many types of crystals



## Typical test run data "day test" W6-chemical

A test run will determine operating conditions required to meet product purity for single or two stage operation



## Visible difference in purity

Visible difference between 99.99wt% (left) and 91.65wt% (right)





On-site demonstration of this technology is possible in various configurations using GEA pilot plants. For more information regarding this technology and your specific configuration requirements, please contact us or get in touch with your local GEA contact on [gea.com](http://gea.com).

GEA Niro PT B.V. Sneeuwhaas 21, 5236 NX 's-Hertogenbosch The Netherlands Phone +31 73 6390 390 [info.niropt.nl@gea.com](mailto:info.niropt.nl@gea.com)

