Unique Know-how Center for Solution Crystallization, Melt Crystallization and Freeze Concentration
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   Advanced Process Solutions in Key Industries
With a history reaching back to 1953 the name of the German GEA Messo PT has become synonymous to innovative tailor-made process solutions in the wide field of solution crystallization. GEA Messo PT crystallization plants can be found in the organic and inorganic chemistry, the environmentally aligned industries, field of food technology as well as in the mining and metal industries. The trend settings activities in melt and freeze concentration derive from the Dutch Niro PT with their unique wash column technology for the recovery of ultrapure organic chemicals as well as high quality products in the food industry (e.g. the best instant coffee and fruit juice concentrates).

GEA Messo PT continues the activities of these both famous names under one roof in two locations. The solution crystallization is operated from Duisburg, Germany, whereas the melt & freeze crystallization is addressed in ’s-Hertogenbosch, in the heart of The Netherlands.
GEA AG

GEA Group Aktiengesellschaft is one of the largest system providers for food and energy processes with about EUR 5.4 billion revenue in 2011. As an internationally operating technology group, the company focuses on process technology and components for demanding production processes in various end markets. The group generates about 70 percent of its revenue from the long-term growing food and energy industries. The company’s workforce comprised over 23,800 employees worldwide as of December 31, 2011. The GEA Group is a market and technology leader in 90% of its business areas. The company is listed in the MDAX index (G1A, WKN 660200). In addition GEA Group has a sponsored level I ADR program in the USA.

GEA Process Engineering

The GEA segment GEA Process Engineering specializes in the design and development of process solutions for the dairy, brewery, food, pharmaceutical, and chemical industries. GEA Process Engineering is recognized as a world leader within liquid processing, concentration (membrane techniques, evaporation & crystallization), industrial drying, powder processing and handling, emission control, solid dosage processing, and aseptic packaging and provides a complete range of services and process systems to the beverage, brewery, chemical, dairy, and food industries. The GEA Process Engineering with its head offices in Copenhagen employs 4,000 people in 50 countries.

One Team

Vision

Within the industries we serve, we want global market leadership in process engineering, solutions and services.

By global market leadership we mean:

- Being among the three largest suppliers in all industrial market segments we choose to be in
- Being recognized as a technology leader in all technology areas we choose to be in
- Servicing our customers wherever they are located

Values

We are guided in our conduct and partnership with stakeholders by our values:

- Customer focus: Customer needs are our prime drivers
- Excellence: We strive to stay ahead and constantly improve
- Reliability: We are trustworthy and take responsibility for what we do
- Teamwork: We add value by working in teams on a global basis
- Respect: We value individuality and show trust in one another
GEA Messo PT is recognized globally as technology supplier and plant constructor in the field of crystalization technologies, especially focusing on solution and melt crystallization as core business. Within this core business GEA Messo PT offers a variety of technology based process engineering services, beginning with the process development in the company’s own R&D facilities and ending up with complete supply of the technology equipment.

The successful installation of more than 1000 crystallization factories and 60 years of trend setting innovation confirm the reliability of our services and make GEA Messo PT the supplier of choice in a broad selection of applications.

GEA Messo PT forms part of the GEA Process Engineering (P segment) of the GEA Group.
GEA Messo PT – Benefits

GEA Messo PT is worldwide leader in the field of melt and solution crystallization covering all engineering services for chemical, food technology, steel technology and environmental industries.

GEA Messo PT’s credit in the field of crystallization and related purification technologies is based on the early Standard-Messo Duisburg founded some 60 years ago and over 30 years melt crystallization success of Niro PT. Today, the entire list of references comprises more than 1000 installations in 60 countries.

GEA Messo PT designs all basic types of solution-based crystallizers, the FC-, the DTB- and the fluidised bed (Oslo-)crystallizer, and melt-based scraped surface crystallizers herewith covering the production of all crystal sizes and crystal size distributions.

The custom solution assuring client’s business targets with accountability and reliability is GEA Messo PT’s strongest benefit. The processes are developed in first-rate test centres for melt and solution crystallization (1,500 m²).

GEA Messo PT processes comprise the integrated know-how necessary to complete the crystallization plant from a single source. This includes all kind of pre-treatment stages, of evaporation technologies (MEE, MRC, Flash), separation by thickeners, hydrocyclones, filters or centrifuges, drying, solids handling, packing, etc.

GEA Messo PT’s plant realizations are combinations of outstanding and innovative product and technology experience with unmatched project execution and accountability supported by the global market presence of GEA Process Engineering companies for the satisfaction of our customers wherever they are.
Our Core Business’ Market Fields

Solution Crystallization

Worldwide, millions of tons of bulk products are crystallized daily from solutions, like sugar, salt and fertilizers. The name of the applied unit operation is mass crystallization, resp. single crystallization from solution. The most common solvent is water. By crystallization the dissolved substance is recovered in high purity and the desired granulometry. Depending on the type of crystallizer the achievable particle size ranges from microns to millimeters. There are three basic types of crystallizers. The FC, the DTB, and the Oslo crystallizer. GEA Messo PT provides all of them.

Wastewater

Concentration processes, especially those to dryness (Zero-Liquid-Discharge) are commonly regarded as evaporation processes but do in fact belong to the field of crystallization from solution if substances are getting crystallized (e.g. calcium sulfate). ZLD processes are always crystallization processes where the water is recovered for recycling. This is one high end of the crystallization technology. Outstanding experience is required to ensure minimal energy consumption, trouble-free operation independently of changing wastewater compositions and selection of the appropriate materials of construction.

White Biotech

Increasing oil prices and the CO2 discussion in connection with the climate change moves the focus on white biotechnology to produce organic basic chemicals in a sustainable way based on renewable resources. Classical products among others are the essential amino acids, citric acid, lactide for PLA, building blocks for various bio-based plastics and also special sugars. Meanwhile even replacements of mineral oil-based chemicals, like e.g. di-carbonic acids, are produced by white biotech processes as alternative commodities for the chemical industry. Solution crystallization is most appropriate to fulfill the downstream demand of the product separation from the various fermentation broths in a perfect way.

Melt Crystallization

In this application field GEA Messo PT’s proprietary Niro PT™ technology has become synonymous for drastically reduced energy consumption, low investment cost and superior product quality. The flexibility of the process to split any feed into two streams which qualities are readily adjustable along with its outstanding energy efficiency, make this process the technology of choice for many customers. The innovation potential of our team is reflected by more than 20 patents which are currently held in this technology field.

Freeze Concentration

When supreme quality liquid food concentrates are requested freeze concentration is the process of your choice. The GEA Messo PT crew in ’s-Hertogenbosch invented, commercialized and optimized this leading edge technology over the last decades. No other concentration processes can obtain the outstanding product qualities which are achievable with the Niro PT™ technology. The very gentle concentration at sub-zero temperatures allows product freshness to be maintained and prevents biological degradation to occur. Since no vapor phase is present all volatile aromas will be preserved in the food concentrates. Various configurations with capacities ranging from 100 to 400,000 tons per year have been installed.
Solution Crystallization

GEA Messo PT is a world leader in providing advanced and innovative process solutions in the field of solution crystallization and related concentration technologies. The expertise covers all basic types of crystallizers, i.e. the FC-, the DTB- and the fluidized-bed (Oslo) crystallizer. Depending on the market demand regarding a specific crystal product quality and/or crystal size distribution GEA Messo PT provides the most suitable crystallizer design. GEA Messo PT offers a wide variety of tailor-made process designs, with a scope of supply ranging from basic engineering till the supply of completely integrated plants including all required unit operations from one single source.

The latter activity includes pre-treatment stages, all evaporation technologies (MEE, MVR, and Flash), and crystal separation by thickeners, hydro cyclones, wash columns, filters or centrifuges, drying and may also comprise solids handling, packing, etc.

GEA Messo PT’s installations are known for their reliability in construction and material, user-friendliness and operation stability.

More than 100 patents in the field of the solution crystallization are the solid proof for GEA Messo PT’s continuous innovation success. The modern and well-equipped R&D centers as well as the credible and experienced phase system experts are the guarantee for the continuation of this success story.
Wastewater. In addition to the classical activities in the field of mass crystallization, GEA Messo PT has been trendsetter in the field of wastewater evaporation and crystallization concepts with focus on ZLD starting from the late seventies. GEA Messo PT was the first in the field of ZLD for the liquid effluents from Flue Gas Desulfurization in power stations. GEA Messo PT was the first plant constructor to design a plant for the recovery of Calcium chloride dihydrate by crystallization and has dominated the German market. One decade later only, the innovative technology principle was even applied to produce Calcium chloride in the pharmaceutical industry. In addition, another innovation is GEA Messo PT’s freeze concentration technology for special hazardous waste stream treatment prior to incineration.

The experience gained in these early ZLD wastewater factories was eventually introduced into a general ZLD concept for industrial locations applied today. This concept comprises chemical brine treatment, membrane concentration, MVR (blower) evaporation and final solidification by evaporative crystallization using the thermo compression technique. The concept offers the lowest operation and investment costs and is applicable for large-scale applications (>100 m³/h).

GEA Messo PT is member in the concentration SBU within the GEA Process Engineering segment. Partners are GEA Wiegand, GEA Process Engineering France (Kestner), GEA Filtration and GEA Niro Inc. in the US. Combined there are over 350 experts cooperating together in chemical treatment, in membrane processes, evaporation and crystallization for the times to come.
White Biotechnology is biotechnology applied to industrial processes, e.g. the use of a living micro-organism to produce chemicals in sustainable ways. Another example is the use of enzymes as catalysts to produce chemicals. White biotechnology usually consumes renewable resources instead of natural resources. That justifies the adjective sustainable compared to traditional processes used to produce industrial goods.

The produced solutions are separated by classical solution crystallization. Typical GEA Messo PT references with an upstream fermentation process are the essential amino carbonic acids like Threonin, Lysine, the Glutamic acid and its salts, and the Cystein; the dicarbonic acids like Succinic and Malic acid as well as the water-soluble vitamin C and its precursor ketogulonic acid. It is generally expected that white biotech will step by step even replace the oil-based production processes on the basis of fermentation of renewable resources such as lactide for PLA, building blocks for various bio-based plastics.
Melt Crystallization

With the early 1990’s Niro PT began to expand into the melt crystallization markets. Melt crystallization provides an economic and energy efficient alternative purification step in cases where standard distillation is unsuitable due to e.g. close boiling isomers, azeotropic systems, heat sensitive products, products that tend to polymerize, explosive substances, etc. The suspension based process provides slow growth rates that allow pure crystal formation even in relatively impure melts. Ultra-pure product can be obtained by efficient separation of the crystals from the impure mother liquor, in many cases after just one crystallization step.

Freeze Concentration

If supreme quality liquid food concentrates are requested the freeze concentration is the unbeatable technology. Invented by Niro PT, commercialized and further developed, this leading edge technology conquered the international market over the last decades. It became grown-up and a well-regarded technology. There isn’t any other concentration process which is able to generate the outstanding product quality achievable with this Niro PT™ technology. The very gentle concentration at sub-zero temperatures conserves product freshness and prevents biological degradation. Since a vapor phase isn’t present all volatile aromas will be kept in the food concentrates. Over 50 freeze concentration plants have been put into operation throughout the world up to now with more than 120 Niro PT™ wash columns in commercial service. Various configurations with capacities ranging from 100 to 400,000 tons per year have been installed.
One of the many reasons for our worldwide success is the unique combination of a comprehensive process know-how in our core technologies “solution and melt and freeze crystallization” combined with an extensive project execution experience collected over 60 years of our company’s history. This exceptional combination allows GEA Messo PT to provide you with innovative and reliable process solutions helping you boosting the efficiency of your operations.

As part of the worldwide GEA network we provide our technologies to the local GEA Process Engineering marketing offices, which contribute their local knowledge and also their established order execution experience. As technology provider we stand for the quality of the supplied technologies and together with the local GEA team we provide the performance and execution warranties with single source responsibility for our customers.

Global Market Presence

Part of the extensive network of GEA Process Engineering companies around the world
Local purchasing reduces investment and saves taxes as well as shipping charges
Efficient communication in local language and the same time zone allows for a direct customer support

Experience

Particular attention is given to properly include upstream and downstream processes in a total system optimization
First class project execution experience
Efficient project management assures that all project milestones are met

Innovation

Our outstanding product and technology experience is the basis for innovative process solutions
Extensive database on physical properties and kinetic data
Ability to prove the innovative designs in our R&D center with bench scale testing and pilot scale demonstration
Experience to convey bench – or pilot scale results to a commercial installation and provide the respective process warranties
We offer a wide variety of plant engineering activities ranging from the conceptual study through the supply of completed integrated plants. We listen to the different project needs and follow the specific scope requirements of our customers in every individual case. We possess the internal resources to supply large and complex projects. The global network of GEA companies provide the local market know-how enabling us to supply all available hardware and services from the region. This way we can offer our customers investment costs savings while still keeping the entire project accountability within GEA. Moreover, GEA operates its own fabrication workshops in China and India which can be used (not only) for projects in these areas.

First Class Project Execution

Conceptual Studies

- Feasibility Studies
- Project Finance Support
- Extensive database on physical properties and equilibrium data
- Process Development using our R&D center for the performance of bench scale testing
- R&D center for pilot scale testing
- Conceptual design

Other Skilled Services

- Project Management Services including “Turnkey” Capabilities
- Global network of local GEA Process Engineering partners
- Erection Supervision
- Commissioning Services
- Training Services

Basic and Detail Engineering

- Pre-Basic Engineering
- Basic Engineering Services
- Detailed Engineering Services
- 3-D design software with walkthrough capability and BOM generation

Hardware Supply

- Supply of equipment with the responsibility for the achievement of the performances
- Expediting and quality control of crystallizers and peripheral equipment
- Supply of large scale equipment (>10m +)
- On-Site assembly of large scale equipment which can only be transported in segments

Our services are not limited to new installations; GEA Messo PT is your partner for the improvement and optimization of existing facilities, as well:

- Capacity increases
- Increasing yield
- Improving the product quality
- Reducing waste streams by separation of valuable components
- Automation of existing processes
- Conversion from batch to continuous operation
- Elimination of incrustation or caking problems
- Energy saving
- Plant inspection
- Plant revamping
In addition to this global GEA network we have developed strategic alliances with reputable partners in those areas where GEA is not present with an own company.

Direct neighborhood to our customers is given by the global presence of the GEA group with a still growing number of GEA Process Engineering marketing companies in the world’s top economies, from Brazil, Canada over China to USA. The well-shaped problem solutions for your technology needs in the field of evaporation, concentration, crystallization as well as Zero Liquid Discharge processes you will get from one hand this way, installed and set into operation by our local GEA offices in your neighborhood which are well aware of all the nation-typical codes and standards, taking advantage of the local knowledge of fabricators and constructors.

For the entire crystallization and the related concentration technologies requested overseas we are used to develop tailor-made process designs by performing basic test works, finally optimize the process designs by iteration with test work and eventually supply the Basic Engineering package together with the supply of key items from our European operations.

GEA Process Engineering locations worldwide

Argentina, Buenos Aires
Australia, Blackburn (Victoria)
Belgium, Mechelen
Brazil, Campinas
Canada, Boisbriand
Chile, Santiago
China, Shanghai
Colombia, Bogota
Czechia, Bruno
Denmark, Copenhagen
Finland, Vantaa
France, Montigny-Le-Bretonneux (Paris)
Hungary, Budapest
India, Vadodara
Ireland, Naas-Co. Kildare
Italy, Milano
Japan, Tokyo
Lithuania, Vilnius
Mexico, Nancalpan
Netherlands, Deventer
New Zealand, Penrose
Poland, Warsaw
Russia, Moscow
Singapore, Singapore
South Africa, Midrand
Spain, Alcobendas
Taiwan, Taipei
UK, Warrington
USA, Columbia

In addition to this global GEA network we have developed strategic alliances with reputable partners in those areas where GEA is not present with an own company.
GEA Messo PT has cultivated the ability to develop and implement specific process designs for the treatment of particular and frequently unique feed stocks in the field of salts, acids or organics recovery and solution processing for the recovery of all kind of crystalline products. These innovative process developments are proven first in our research facility. Our experience and expertise in the scale-up of such test results allow us to provide full process warranties for the resulting commercial installations. Such development projects represent a significant part of our business nowadays.
Experience Meets Innovation:

**Crystallization from Solution**

GEA Messo PT’s worldwide success roots in the unique combination of comprehensive process design know-how combined with an unrivaled range of experience gained in the fields of melt, freeze and solution crystallization for the bulk and fine chemical industries, the food and steel industries as well as in the field of pollution control activities for wastewater zero-liquid-discharge worldwide.

Continuous and qualified innovation in the fields of crystallization as result of our Research & Development has been the driving force to be always ahead of the time with new and intensified process solutions in every decade to the benefit of our customers.

**Solution Crystallization**

**Fertilizer**

*Ammonium Sulfate*

GEA Messo PT has successfully implemented more than 40 Ammonium sulfate plants worldwide. That covers applications in the field of by-product Ammonium sulfate in caprolactam and methylmetacrylate processing as well as Ammonium sulfate from scrubber waters behind urea prilling towers. Another important application is the use of waste sulfuric acid for reaction crystallization to Ammonium sulfate.

*Potash*

GEA Messo PT supplies the Potash industry with production facilities for Potassium chloride and Potassium nitrate, with intermediate or by-products like Carnallite, Epsomite, Kieserite, Sodium chloride and other minerals from natural deposits. Our processes are custom-designed to match the particular requirements for conventional or solution mining processes. Messo has delivered successful processes for both carnallite and sylvinite feed sources.

**Food and Food related**

GEA Messo PT has continuously contributed innovative evaporation and crystallization plants to recover food or food additives from their mineral resources resp. fermentation broths.

**Inorganic Chemicals**

Among the long list of references that GEA Messo PT has accumulated in Chemical Industry are commodities such as Sodium sulfate and Calcium chloride; the list also includes many other process developments for specific applications.

**Among a lot of others**

- Potassium nitrate
- Potassium chloride
- Potassium carbonate
- Sodium nitrate
- MAP-DAP
- Urea
- Ammonium sulfate from FGD (Urea prills)
- Granular Ammonium sulfate from Caprolactam (evaporation & reaction)
- Granular Ammonium sulfate from Methylmetacrylate (evaporation & reaction)
- Granular Ammonium sulfate from Sulphuric acid (reaction)

**More than 150 others**

- Sodium sulfate
- Calcium chloride

**Among a lot of others**

- Amino acids
- Ascorbic acid and derivates
- Citric acid
- Caffeine
- Malic acid
- Succinic acid
- Tartaric acid
Metals & Mining

GEA Messo PT’s evaporation and crystallization plants are important building blocks in the fields of metal recovery processes. These installa-
tions are part of the refining and production of transition metals from their respective ores, in the form of their salts. GEA Messo PT plants also provide innovative treatment of intermediate solutions and recovery of by-products like Sodium or Ammonium sulfate.

Organic Chemicals

The field of organic chemicals is the playground for both, the crystallization from solution and the melt crystallization as well. Whereas the crystallization from solution is applied for the production of bulk products, like e.g., the bisphenol A phenol adduct for the production of polycarbonate or the adipic acid for the nylon synthesis, the melt crystallization is the typical process for the recovery of high grade pure organics for special applications. Typical Products in the field of Solution Crystallization are displayed on the right.

Salt

Since decades GEA Messo PT is known worldwide for the design and supply of salt factories which match the individual requirements of table salt as well as for producing high grade vacuum salt, suitable for chloralkali electrolysis. Recently, all salt business in GEA has been consolidated in our Duisburg operations and we are supplying vacuum salt plants, solar salt wash factories and technologies and plants for chemical brine purification (various processes) from both rock salt and sea salt feed stocks.

Waste Management

Zero Liquid Discharge (ZLD)

GEA Messo PT combines innovative solutions of broad interdisciplinary range (chemical treatment, membrane processes, evaporation and crystallization) to achieve recovery of processing water from aqueous waste solutions at low energy consumption and capital investment. These processes include upstream treatment plants, like Gypsum removal and heavy metals precipitation, and they operate in a range of end targets, from volume reduction to Zero Liquid Discharge.

White Biotech

The crystallization from solutions is a typical brick in all downstream technologies applied for the recovery of products from fermentation broths. Typical products have been classically the water soluble amino acids, citric acid and ascorbic acid (Vitamin C) with its precursor ketogulonic acid. Due to the current trend to recover more and more organic basic chemicals by fermentation of renewable resources the number of fermented products is steadily increasing at the moment. GEA Messo PT is active in this field with membrane filtration, concentration, as well as evaporation and crystallization until separation and drying processes.
Experience Meets Innovation:

Crystallization from Melt

Melt Crystallization

for Organic Chemicals

GEA Messo PT combines innovative melt crystallization processes with wash column separation which offers an economical and energy efficient process for the purification/separation of isomers, azeotropic systems, temperature sensitive substances, compounds that tend to polymerize and explosive substances.

Some examples of products
- Benzoic acid
- L-Lactide
- p-Nitrochlorobenzene
- Tetramethylbenzene
- Caprolactam
- Monochloroacetic acid
- o-Phenylphenol
- p-Dichlorobenzene
- Methylenediphenylisocyanate (MDI)
- Phosphoric acid
- Toluenediisocyanate
- Methacrylic acid
- Acrylic acid
- p-Xylene
- p-Chlorotoluene
- Hydrogen peroxide
- Ethyllactate
- Acetonitrile

Freeze Concentration

for Aqueous Food Products

GEA Messo PT provides the unique freeze concentration process for the concentration of, e.g. liquid coffee and tea extracts and all kinds of citrus – and other fruit juices. The process is also used for the concentration of alcoholic beverages like beer and wine, as well as production of ice beer by slush freezing technology.

Some examples of products
- Beer concentration
- Wine concentration
- Citrus juice concentration
- Coffee concentration
- Vinegar concentration
- Cider concentration (for transports)
- Ice Beer
- Fruit juice concentration
- Dairy product concentration
- Vegetable extract concentration

for Hazardous Waste Water Streams

In special cases, the freeze concentration process can provide savings on incineration costs by recovery of up to 80% of the water.
Quality counts
Our Product Responsibility

We know how!
GEA Group is a global mechanical engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX Europe 600 Index.